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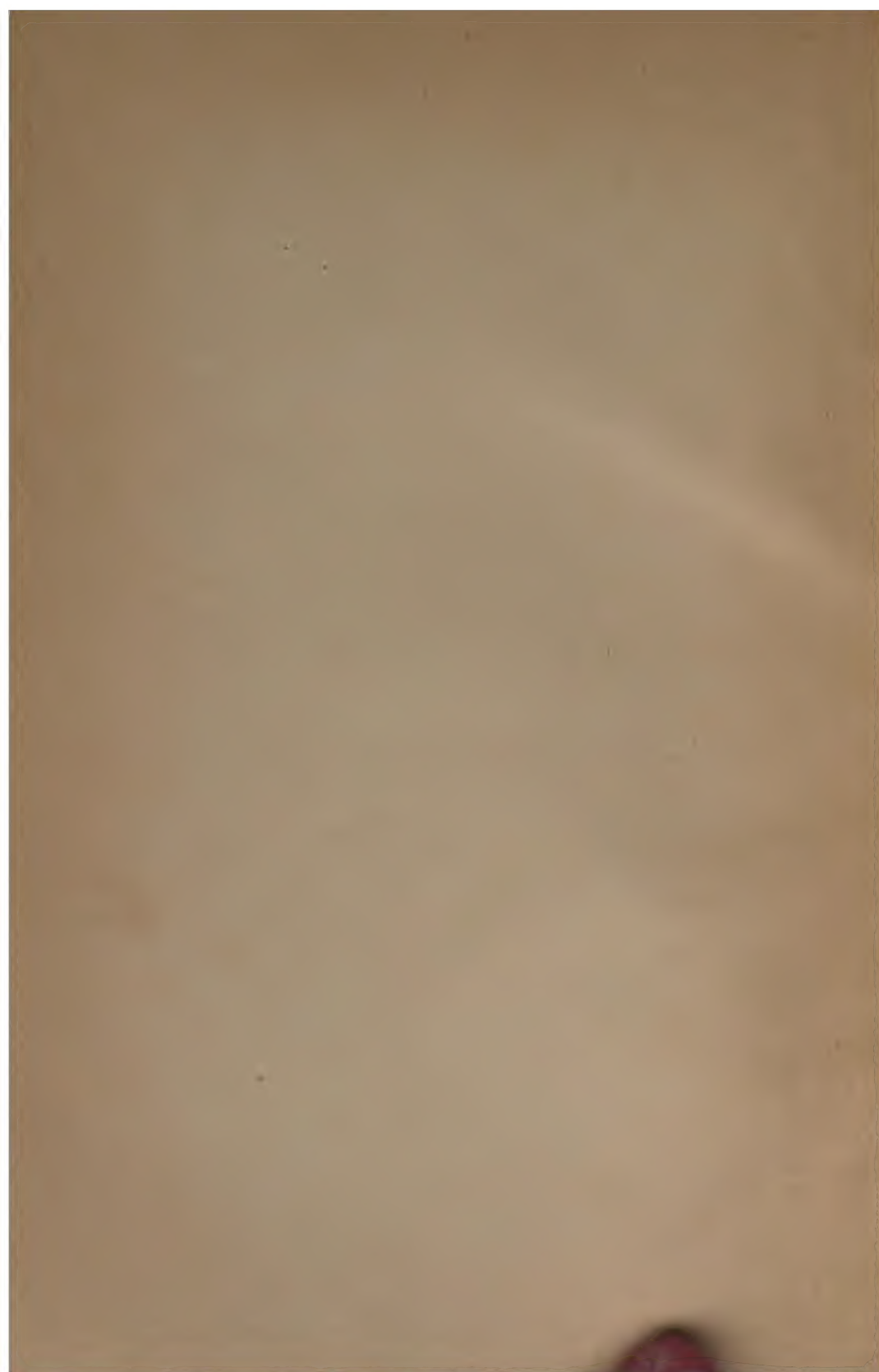
XI INTERNATIONAL
NAVIGATION CONGRESS

REPORT OF PROCEEDINGS

5^t Petersburg 1908







REPORT
OF
PROCEEDINGS

PERMANENT INTERNATIONAL ASSOCIATION
OF
NAVIGATION CONGRESSES
38, rue de Louvain, BRUSSELS

XIth INTERNATIONAL NAVIGATION CONGRESS

St-Petersburg 1908

REPORT
OF
PROCEEDINGS



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HIS MAJESTY EMPEROR OF RUSSIA

NICOLAS II

HIGH PROTECTOR OF THE CONGRESS

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INTRODUCTION



HIS IMPERIAL HIGHNESS THE GRAND DUKE

MICHAEL ALEXANDROVITCH

FIRST HONORARY PRESIDENT

The XIth. International Navigation Congress was held at St. Petersburg from 31st. May to 7th. June 1908 under the high patronage of H. M. the Emperor of Russia.

It was organised, thanks to the initiative and co-operation of the Imperial Government, by the Permanent International Association of Navigation Congresses whose headquarters are at Brussels, in accordance with Art. 4. of the Statutes.

The International Commission, composed of members of the various nationalities which are represented in the body of the Association, together with a local organising Commission, appointed specially for the duration of the Congress, were jointly responsible for drafting and supervising the programme of work which was carried out in a most satisfactory manner.

The St. Petersburg Congress is therefore the second example of a perfectly successful, energetic and unbroken co-operation of two distinct organisations, namely, of a central Commission and a local Commission. The former directs the work of the Association as a whole, frames its regulations and accepts responsibility for these, has the controlling voice in all matters and the mission of increasing the financial position and technical importance of the Association. On the other hand the local Commission is merely temporarily appointed for the duration of a session of the Congress to deal principally with measures of local interest which are schemed and executed to facilitate the proper working of the session in view.

It was at the meeting of the Commission held at Milan on September 23, 1905, that the much regretted Mr. Ghercévanoff promised, in conjunction with Mr. de Timonoff, to approach the Russian Government with a view to holding the XIth. International Navigation Congress at St. Petersburg, in 1908.

On April 30, 1906, Mr. Ghercévanoff advised the General

Secretary of the Association that « the organisation of the next Congress was definitely settled and that the meeting would take place during the month of May ».

This was confirmed by Mr. Ghercévanoff at the meeting of the Commission which was held at Brussels on May 28, 1906, when the official invitation of H. M. the Emperor of Russia was duly transmitted. The Commission promptly and gratefully accepted the invitation and on the very same day the list of questions for discussion was drawn up for the agenda of the XIth. Congress.

The local organising Commission was constituted in 1906. Mr. Ghercévanoff was appointed president and Mr. V. E. de Timonoff was appointed General Secretary of the Congress; both these gentlemen being already members of the Permanent Council of the Permanent International Association of Navigation Congresses.

On the 29 May, truly a day of mourning, the sad death of Mr. Ghercévanoff, the president for the Russian Congress, occurred quite unexpectedly in the midst of the active preparations for the Congress.

Mr. V. E. de Timonoff, who as we know had already undertaken the onerous duties of General Secretary, immediately agreed to devote himself still further to the great work already commenced by accepting the presidency.

The members of the organising Commission residing at St. Petersburg, thereupon formed themselves into a Committee of Administration which was sub-divided into seven special sub-committees, as follows : —

1. Executive Committee : President Mr. V. E. de Timonoff ;
2. Excursions Committee : Presidents Messrs. Nagel (deceased on 5/11 February 1908) and V. E. de Timonoff ;
3. Lodgings Committee : Presidents Messrs de Jevane and Drigenko ;
4. Reception Committee : Presidents Messrs. de Bünting and Tsionglinsky ;
5. Publications Committee (Excursion guide and Russian edition of the work of the Congress) : Presidents Messrs. S. Maximoff and Bormann ;
6. Exhibition Committee : Presidents Messrs. Langouby and Schokalsky ;

7. Finance Committee (Funds and Accounts of the Congress) : President and Treasurer, Mr. Müller.

On the 3rd. August 1906, the Executive Committee, formed out of the Permanent International Commission, addressed a letter to the chiefs of delegation of the latter asking their co-operation in drawing up the list of reporters.

This co-operation was afforded with the most commendable promptitude and notifications of the adhesion of Belgium, France, Italy, Switzerland, Great Britain, Germany, the Netherlands, Russia, Austria and the United States were thereupon sent in to the Secretarial Department.

The Russian national Committee for its part followed precedent and arranged specially for the Reports to be supplied by Russia. In accordance with Art. 13 of the regulations of the Commission of the International Association, it submitted a list of candidates to be invited to send in reports for Russia, and drew up a list of names of those who should be asked to act as general reporters. Furthermore it arranged for the translation of all matters touching the Russian language.

Finally the local Commission, in conjunction with the chiefs of delegation and the Executive Committee, distributed broadcast throughout the world, illustrated pamphlets and circulars in four languages (German, English, French and Russian) calling attention to the forthcoming XIth. Congress and the success which it would in all likelihood attain.

The first circular gives all the general information concerning the Congress, its agenda, list of general reporters, and preliminary programme of excursions, etc.; it also defines the conditions of membership of the Congress.

This circular was followed by five others giving information regarding passports, customs, hotel and lodging accommodation at St. Petersburg, facilities and rebates on Russian and foreign railways, particulars of excursions and optional trips, ladies' Committee, local Commissions in provincial towns, clubs open at St. Petersburg to the members of the Congress, proposed receptions in various Russian towns, etc.

Meanwhile this local Commission submitted to the Association, that is to say to the Permanent Commission, a proposal for completing the programme of the XIth. Congress by inscrib-

ing on its agenda a certain number of questions dealing with the regimen of waters from an agricultural point of view.

The Russian proposal, sanctioned by the Executive Committee, was favourably received and two fresh questions were entered on the agenda of the XIth. Congress by the Permanent Commission.

Soon afterwards, on the 23rd January 1907, the local Commission on behalf of the Imperial Russian Ministry of Marine, expressed to the Association the desire of extending the programme of the Congress so as to include questions concerning the security of maritime navigation.

This wish was accorded and new reporters were invited to collaborate in the wider programme. Thus, whereas the new and principal feature of the Milan Congress may be said to be the inclusion of questions dealing with the propulsion of ships and the working of ports, we may consider the St. Petersburg Congress to be distinguished from previous Congresses by a more thorough enquiry into questions relating to agricultural hydraulics and security of navigation.

The Permanent International Commission, having as we have shown, drawn up a complete programme for the XIth. Navigation Congress, then proceeded to select the members of the sectional committees as well as the Reporters and General Reporters.

It invited foreign governments to send official delegates to represent them at the Congress. It made repeated efforts to persuade other Governments and corporations to become members of the Association. These efforts were crowned with success and after years of attempt it had the rare good fortune to obtain the adhesion of the British Government to this International Work. One of its functions also consisted in obtaining reports, and in preparing, hurrying, translating and editing them; likewise it had to answer all kinds of questions and to be constantly in touch with St. Petersburg.

In acting thus the Permanent Commission carried out the functions attributed to it by the statutes. We will not dwell further upon this point, as we do not wish to lose sight of the important work carried out by the local Commission.

In the first place the latter held many meetings for the purpose of organising special Commissions and of defining their duties. It took care to give them the greatest practical effect

PALACE OF THE CONSERVATOIRE.



Headquarters of the Congress (left wing).

by arranging that they should work together without clashing and without at the same time interfering with this liberty of action or restraining their initiative. The local Commission was everywhere and thought of everything.

The President of the local Commission succeeded in obtaining the High Patronage of H. M. the Emperor, and the consent of the Ministers of Interior, Ways and Communications, Marine, Commerce and Industry, Finance and Agriculture and the Mayor of St. Petersburg to act as honorary presidents.

The local Commission invited foreign Governments through diplomatic channels to nominate official delegates to the XIth. Congress. It solicited and obtained the adhesion of many Government departments and corporations.

It obtained the necessary funds and credits for a session which held out every prospect of being a brilliant one. The Russian Government contributed 50,000 roubles towards expenses. Various Ministries and Government departments contributed further sums and thus increased considerably the funds available for meeting the expenses.

Finland contributed 40,000 roubles to be used partly for entertainments and partly for technical exhibitions.

These magnificent results are the work of the local Commission. Furthermore, with a view to ensure the success of the Congress and of its attendant entertainments and receptions, this local Commission appointed a Committee of patronage composed of important and influential personages who would be able to render the greatest assistance at the proposed meetings and receptions.

The local Commission, with the assistance of the Permanent Commission and the gracious co-operation of a large number of the most energetic members of the Association, succeeded in obtaining certain facilities and rebates on all the railway lines which have termini in St. Petersburg.

In Berlin our German colleagues organised a fraternal and scientific reception for the members of the Congress.

In Russia, twenty local Committees were formed, which vied with each other in zeal and attention with a view to render the sojourn of their foreign colleagues in their country as agreeable as possible.

The work of the XIth. Congress was particularly important and will leave its impress in the annals of the Association.

In order to reduce the number of papers, which were too numerous at Milan, the reporters in this instance were limited to one representative for each country for each question or communication. Nevertheless the number of papers still reached 94 of which 78 were ordinary reports and 16 general reports.

The Report of Proceedings which is appended will give an excellent idea of the work of the Association and of the standing of the reporters who have contributed so largely to the success of the session. The conclusions arrived at by the Association will occupy a worthy place in the list of well considered resolutions which have been taken at previous Congresses.

We will not deal here with the brilliant excursions which are described *in extenso* in the following pages.

A. D.



MR. V.A.E. DE TIMONOFF
GENERAL PRESIDENT OF THE CONGRESS

GENERAL INFORMATION

COMMITTEES

UNDER THE HIGH PATRONAGE OF
HIS MAJESTY THE EMPEROR OF RUSSIA

FIRST HONORARY PRESIDENT

H. I. H. the Grand Duke MICHEL ALEXANDROVITCH.

HONORARY PRESIDENTS

Stolypine, P. A., Ministre de l'Intérieur, Président du Conseil des Ministres, Membre du Conseil de l'Empire, Secrétaire d'État, Maître de la Cour Impériale, Conseiller d'État actuel.

Schaffhausen-Schoenberg-Eck-Schaufuss, N. K., Ministre des Voies de Communication, Membre du Conseil de l'Empire, Ingénieur du Génie Militaire, Lieutenant Général.

Kokovtsoff, V. N., Ministre des Finances, Membre du Conseil de l'Empire, Secrétaire d'État, Conseiller privé actuel.

Dikoff, J. M., Ministre de la Marine, Aide-de-camp-Général, Vice-Amiral.

Chipoff, J. P., Ministre du Commerce et de l'Industrie, Conseiller privé.

Vassiltchikoff, prince B. A., Chef de la Direction Générale de la Propriété Agricole et de l'Agriculture, Membre du Conseil de l'Empire, Conseiller d'État actuel, Maître des Écuries à la Cour Impériale.

Restsoff, N. A., Maire de la ville de Saint-Petersbourg, Conseiller d'État, Ingénieur.

Committee of Patronage

PRESIDENTS

Boström, I. F., Contre-Amiral, Adjoint du Ministre de la Marine.

Ivanitzki, B. E., Conseiller privé, Sénateur, Adjoint du Chef de la Direction Générale de la Propriété Agricole et de l'Agriculture.

Konovaloff, D. P., Conseiller privé, Ingénieur des Mines, Adjoint du Ministre du Commerce et de l'Industrie.

Miassoïédoff-Ivanoff, V. A., Conseiller privé, Ingénieur des Voies de Communication, Adjoint du Ministre des Voies de Communication.

Ostrogradsky, M. A., Conseiller privé, Adjoint du Ministre du Commerce et de l'Industrie.

Pokrovski, N. N., Conseiller d'État actuel, Adjoint du Ministre des Finances.

Poliénoff, A. D., Conseiller d'État actuel, Adjoint du Chef de la Direction Générale de la Propriété Agricole et de l'Agriculture.

Saloff, V. V., Conseiller privé actuel, Ingénieur des Voies de Communication, Président du Conseil des Ingénieurs au Ministère des Voies de Communication.

Wendrich, von A. A., Lieutenant-Général, Ingénieur Militaire, Adjoint du Ministre des Voies de Communication.

MEMBERS

Adadouff, N. E., Conseiller privé, Ingénieur des Voies de Communication, Membre du Conseil des Ingénieurs.

Alexéïeff, K. A., Conseiller privé, Directeur de la Navigation Commerciale au Ministère du Commerce et de l'Industrie.

Armitstede, G. I., Maire de la ville de Riga.

Arsénieff, N. P., Conseiller privé, Président de la Direction Générale de la Société de Crédit.

Artamonoff, N. D., Lieutenant-Général, Chef de la Direction de la Topographie Militaire.

Avelan, T. K., Aide-de-Camp Général, Amiral, Ancien Ministre de la Marine.

Béklémicheff, N. N., Président de la Ligue de la rénovation de la flotte.

Berg, Comte T. G., Chambellan à la Cour de Sa Majesté l'Empereur, Président de la Société Livonienne d'Amélioration des Communications fluviales.

Bielélioubski, N. A., Docteur Ingénieur, Conseiller privé, Membre du Conseil des Ingénieurs, Professeur émérite de l'Institut des Ingénieurs des Voies de Communication.

Birilioff, A. A., Amiral, Membre du Conseil de l'Empire, Ancien Ministre de la Marine.

Boudzinski, S. C., Lieutenant-Général, Inspecteur en Chef des Travaux Maritimes.

- Boukharine**, M. N., Conseiller privé, Membre du Conseil du Ministre des Voies de Communication.
- Brandt**, A. A., Conseiller d'Etat actuel, Ingénieur des Voies de Communication, Professeur émérite et Directeur de l'Institut des Ingénieurs des Voies de Communication.
- Broussiloff**, L. A., Contre-Amiral, Chef de l'Etat-Major de la Marine.
- Danilevski**, A. I., Conseiller privé, Professeur émérite, Chef de l'Académie Impériale Militaire de Médecine, Président de la Société pour la protection de la santé publique.
- Deeker**, R. R., Vice-Amiral, Président de l'Administration du Chantier Naval Baltique.
- Dreiersdorff**, V., Maire de la ville de Libau.
- Florine**, A. V., Conseiller d'Etat actuel, Ingénieur des Voies de Communication, Chef de la Direction des ports de Commerce.
- Gavrilenko**, A. P., Directeur de l'Ecole supérieure Technique de Moscou.
- Gortchakoff**, A. N., Conseiller privé, Inspecteur en Chef au Ministère des Voies de Communication.
- Gouliaieff**, B. G., Maire de Cronstadt (Russie).
- Goutchkoff**, N. I., Maire de la ville de Moscou.
- Hoerschelmann, de**, S., Lieutenant-Général, Gouverneur Général de Moscou.
- Houbert**, W. O., Conseiller d'Etat, Président de la Société pour la protection de la santé publique.
- Iossa**, N. A., Conseiller privé, Président du Comité Scientifique des Mines.
- Ioupatoff**, J. F., Conseiller d'Etat actuel, Directeur de l'Institut Polytechnique de Varsovie.
- Jakovleff**, N. M., Contre-Amiral, Directeur au Ministère de la Marine.
- Jastrzembski**, S. N., Conseiller privé, Membre du Conseil du Ministère des Voies de Communication.
- Jilinski**, J. I., Lieutenant-Général, Directeur de l'Hydraulique Agricole.
- Kachérininoff**, A. P., Vice-Amiral, Président de l'Administration de la Navigation Russe sur le Danube.
- Karpinski**, A. P. Conseiller privé, Ingénieur des Mines, Directeur Honoraire du Comité Géologique, Membre de l'Académie Impériale des Sciences.
- Kétritz**, C. E., Conseiller privé, Membre du Conseil des Ingénieurs du Ministère des Voies de Communication.

Khilkoff, M. I., Prince, Membre du Conseil de l'Empire, Ancien-Ministre des Voies de Communication.

Kislianski, V. N., Président de la Section de Varsovie de la Société pour l'avancement de l'industrie et du commerce russes.

Kolobow, G., Directeur de la Société de Navigation de Schlüsselbourg.

Kologrivoff, J.-S., Conseiller privé actuel, Ingénieur des Voies de Communication, Membre du Conseil du Ministère des Voies de Communication.

Koudrine, V. S., Conseiller privé actuel, Inspecteur en Chef de Médecine de la Marine, Chirurgien à la Cour de Sa Majesté l'Empereur.

Kounitzki, S. C., Conseiller d'État actuel, Membre du Conseil des Ingénieurs du Ministère des Voies de Communication.

Krestovnikoff, G. A., Président du Comité de la Bourse de Moscou.

Kronenberg, L. L., Baron, Conseiller d'Etat actuel, Président du Conseil du chemin de fer de Varsovie-Vienne.

Kryloff, A. N., Colonel, Inspecteur Général de la Construction des Navires.

Küttner, J. S., Conseiller privé, Professeur émérite, Membre du Conseil des Ingénieurs du Ministère des Voies de Communication.

Larsson, A., Président du Comité de la Bourse de Riga.

Lender, V. A., Maire de la ville de Réval.

Liétounovskiy, P. N., Président de l'Administration de la Société Orientale des Entrepôts.

Lischine, M. A., Conseiller privé, Ingénieur des Voies de Communication.

Litvinoff-Falinsky, V. P., Conseiller de Collège, Ingénieur Technologue, Directeur de l'Industrie au Ministère du Commerce et de l'Industrie.

Margoline, D. S., Directeur-Administrateur de la Société de Navigation sur le Dnièpre.

Massé, K. F., Président de la Société Finlandaise de Navigation.

Maximovitch, N. I., Conseiller d'État actuel, Ingénieur des Voies de Communication, Directeur des Routes et des Voies Navigables.

Metz, M. T., Président de la Société Impériale de Navigation.

Mikhailoff, C. J., Lieutenant-Général, Membre honoraire de l'Académie Impériale des Sciences.

Moguilevtseff, Président du Comité de la Bourse de Kief.

Moïsséeff, N. I., Maire de la ville d'Odessa.

Nadporojsky, V. B., Conseiller d'État actuel, Ingénieur des Voies de Communication, Président du Conseil Technique du Ministère du Commerce et de l'Industrie.

Nagel, A. B., Conseiller d'État actuel, Membre du Conseil des Ingénieurs au Ministère des Voies de Communication (décédé le 5/18 Février 1908).

Némiéchaieff, C. S., Conseiller privé, Ingénieur des Voies de Communication, Chef des chemins de fer du Sud-Ouest, Ancien Ministre des Voies de Communication.

Nicolai, L. F., Conseiller privé, Ingénieur des Voies de Communication, Membre du Conseil des Ingénieurs au Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication (décédé le 10/23 Mars 1908).

Niconoff, C. P., Vice-Amiral, Commandant en Chef de la Flotte et des ports et Chef de la défense maritime de la mer Baltique.

Niedermüller, A. G., Contre-Amiral, Président du Comité de la Flotte Volontaire.

Nikitine, S. N., Conseiller d'État actuel, Président du Comité Hydrologique, Géologue en Chef du Comité Géologique.

Nobel, E. L., Conseiller de Commerce, Président de la Compagnie « Nobel Frères ».

Nolde, Baron, M. E., Conseiller d'État actuel, Directeur de la Chancellerie du Ministre du Commerce et de l'Industrie.

Ostrovski, N. S., Conseiller d'État actuel, Président de l'Administration du Chemin de fer Moscou-Vindava-Ribinsk.

Ouspiensky, J. P., Contre-Amiral, Chef de la Direction des Constructions Navales.

Paltoff, A. A., Conseiller d'État actuel, Chambellan de la Cour Impériale, Directeur de la Chancellerie du Ministre des Voies de Communication.

Paromensky, A. I., Lieutenant-Général, Directeur de l'École Maritime des Ingénieurs.

Pétroff, N. P., Général du Génie, Membre du Conseil de l'Empire.

Poretchkine, T. S., Général-Major, Inspecteur Général de la Section Mécanique de la Marine.

Prozoroff, A. I., Conseiller d'État actuel, Président du Comité de la Bourse de Saint-Petersbourg.

Ratkoff-Rojnoff, J. V., Directeur de la Compagnie de Navigation « Samoliot ».

Reson, von, A. K., Conseiller privé, Sénateur.

Rothwand, S. M., Président du Comité de la Bourse de Varsovie.

Roukhloff, S. V., Conseiller privé, Membre du Conseil de l'Empire.
Schitoff, J. A., Président de la Compagnie de Navigation sur le Volga.

Schnobel, N. E., Président du Comité de la Bourse de Libau.

Starck, O. V., Vice-Amiral.

Staritzky, C. S., Contre-Amiral, Président de la Société de Navigation « Kavkas et Mercuri ».

Stenger, V. A., Directeur de la Chancellerie du Ministre de la Marine.

Stieblin-Kamensky, E. E., Conseiller privé, Directeur de la Chancellerie du Ministère de la Marine.

Tchernycheff, T. N., Conseiller d'État actuel, Ingénieur des Mines, Directeur du Comité Géologique, Membre de l'Académie Impériale des Sciences.

Valouieff, T. M., Conseiller d'Etat actuel, Chambellan à la Cour impériale, Chef des Chemins de fer du Nord-Ouest.

Vessélago, S. P., Chambellan à la Cour Impériale, Directeur des Ports de Commerce au Ministère du Commerce et de l'Industrie.

Vilkitzky, A. I., Général-Major, Chef de la Direction Générale de l'Hydrographie.

Virén, R., Commandant en chef de la Flotte de la Mer Noire.

Virénus, A. A., Contre-Amiral, Président du Comité Technique de la Marine.

Yermoloff, A. S., Conseiller privé actuel, Membre du Conseil de l'Empire, Ancien Ministre de l'Agriculture.

Zélénoi, N. A., Vice-Amiral.

General Presidency

GENERAL PRESIDENT

de Timonoff, V. E., Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller d'État actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil Supérieur Technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil Supérieur Technique au Ministère du Commerce et de l'Industrie, Membre du Comité Hydrologique.

NOTE. — Mr. M. N. Ghercévanoff, first General President of the XIth. Navigation Congress, died whilst the Congress was being organised, on 16/29 May 1907.

GENERAL VICE-PRESIDENTS

Germany

Freiherr von Coels von der Brügghen, Unterstaatssekretär
im Ministerium der öffentlichen Arbeiten.

Austria

Russ, Victor, Dr. Mitglied des Herrenhauses, Präsident der österreichischen Nordwest Dampfschiffahrts-Gesellschaft, Mitglied des k. k. Staatseisenbahnrates und des Beirates für Wasserstrassen.

Belgium

Troost, Directeur Général des Ponts et Chaussées.

France

Quinette de Rochemont, Baron, Inspecteur Général des Ponts et Chaussées, Directeur des Phares et Balises.

Hungary

Farago, L., Sectionsrat, Stellvertreter der K. Ung.-Landes-Wasserbaudirektion.

Italy

Maganzini, Italo, Commandeur, Président de Section du Conseil supérieur des travaux publics, Inspecteur suprême du génie civil, Membre de la Commission internationale consultative du canal maritime de Suez.

Japan

Inuzuka, Katsutaro, Director of the Bureau of Public Works, Department of the Interior.

Netherlands

De Jongh, Ingénieur en chef Directeur des Travaux de la Ville de Rotterdam.

MEMBERS

All the members of the Organising Commission. (See pp. 23.)

GENERAL SECRETARY OF THE CONGRESS

When the organising Commission for the XIth. International Navigation Congress was formed in 1906, the functions of General Secretary of the Congress were entrusted to Mr. V. E. de Timonoff. On the death in 1907 of Mr. M. N. Ghercévanoff, President of the Organising Commission, Mr. de Timonoff was appointed in his stead and at the same time he was good enough to continue to carry out his duties as General Secretary of the Congress, so that no further change was necessary in the management of this department.

SECRETARIES OF THE CONGRESS.

Germany

Symphér, Geheimer Oberbaurat, Vortragender Rat im Ministerium der öffentlichen Arbeiten.

Austria

Worms, Stefan, Ministerialsekretär.

Belgium

Dufourny, A., Secrétaire Général de l'Association, Ingénieur en chef Directeur des Ponts et Chaussées.

France

de Joly, Ingénieur en chef des Ponts et Chaussées.

Hungary

Egan, E., Ingenieur, Inspector der Kgl.-Ung. Staatsbahnen.

Italy

Sanjust di Teulada, E., Ingénieur en chef du Génie Civil, à Milan.

Japan

Moriama, Keizaburo, Commander, Naval Attaché to the Japanese Embassy, Paris.

Russia

Boutakoff, A. G., Capitaine de vaisseau.

Epantchine, G. A., Capitaine de frégate.

Ivanoff, T. N., Capitaine de vaisseau.

- Kalinine, I. P.**, Ingénieur des Voies de Communication.
Kareïscha, S. D., Professeur à l'Institut des Ingénieurs des Voies de Communication.
Kleiber, W. H., Ingénieur des Voies de Communication.
Krouglikoff, N. S., Conseiller d'État actuel, Ingénieur des Voies de Communication, Chef de la Section technique de l'Administration des chemins de fer de l'Est de la Chine.
Maximoff, S. P., Ingénieur des Voies de Communication.
Treniukhinn, V. M., Ingénieur des Voies de Communication.

Organising Commission and Special Commissions

PRESIDENT

- de Timonoff, V. E.**, Ingénieur des Voies de Communication et des Constructions civiles, Conseiller d'État actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil supérieur technique du Ministère des Voies de Communication, Professeur à l'Institut des ingénieurs des Voies de Communication, Membre du Conseil supérieur technique au Ministère du Commerce et de l'Industrie, Membre du Comité hydrologique.

MEMBERS

- Borman, A. N.**, Ingénieur Naval.
Bunting, von, M. G., Conseiller d'État actuel, Chambellan de la Cour de Sa Majesté l'Empereur.
Czarnomski, W. H., Conseiller d'État actuel, Ingénieur des Voies de Communication.
Drigenko, T. K., Général-Major du Corps des officiers-hydrographes de la Marine.
Jevane (de), S. M., Conseiller d'État actuel, Ingénieur des Voies de Communication.
Kandiba, B. N., Conseiller d'Etat, Ingénieur des Voies de Communication, Professeur à l'Institut des Voies de Communication.
Kleiber, W. H., Ingénieur des Voies de Communication.
Lévandovsky, F. J., Conseiller d'État actuel, Ingénieur des Voies de Communication.

Lipine, A. N., Conseiller d'État actuel, Ingénieur des Voies de Communication.

Mangouby, M. S., Ingénieur des Voies de Communication.

Maximoff, S. P., Ingénieur des Voies de Communication.

Merczyng, H. C., Conseiller d'État actuel, Ingénieur des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication.

Mikhaïloff, D. S., Capitaine de frégate.

Müller, A. B., Ingénieur des Voies de Communication.

Schokalski, J. M., Général-Major de l'Amirauté, Président de la Section de Géographie physique de la Société impériale de Géographie, Chef du Service météorologique de la Direction générale de l'Hydrographie au Ministère de la Marine.

Tomashevski, V. K., Conseiller d'État actuel, Chef de la Section des Voies navigables à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication.

Tsionglinski, M. F., Ingénieur des Voies de Communication.

I. — Executive Commission

This Commission, composed of the Presidents of all the Special Committees of the Organising Commission, was co-opted to the Organising Commission.

PRESIDENT

de Timonoff, V. E., Ingénieur des Voies de Communication et des Constructions civiles, Conseiller d'État actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil supérieur technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil supérieur technique au Ministère du Commerce et de l'Industrie, Membre du Comité hydrologique.

MEMBERS

von Bünting, M. G.

Maximoff, S. P.

de Jevane, S. M.

Müller, A. B.

Mangouby, M. S.

II. — Reception Committee

Organising receptions of the members of the Congress by the Organising Commission, by Government Bodies, by Municipalities, by Stock Exchange Committees, etc.

PRESIDENTS

von Bünting, M. G.

Tsionglinski, M. F.

MEMBERS

The General Secretary of the Congress.

All the presidents of the local Commissions. (See p. 30.)

III. — Editorial Committee

Editing and publishing the Excursion Guide, and editing the Russian translations of the papers read before the Congress with a view to their publication in the form of a special edition of the work of the Congress.

PRESIDENTS

Maximoff, S. P.

Borman, A. N.

MEMBERS

The General Secretary of the Congress.

de Jevane, S. M.

Kandiba, B. N.

Lipine, A. N.

Tomaschewski, W. H.

IV. — Finance Committee

Accounts of the Congress. Treasury for funds arising from subscriptions from temporary members and from payments from members for their lodgings and excursions.

PRESIDENT

Müller, A. B.

MEMBERS

The General Secretary of the Congress.

Lévandovksi, F. J

Kandiba, B. N.

V. — Lodgings Committee

Headquarters of the Congress. Buffet of the Conservatoire. Lodgings for Members at Saint Petersburg. Congress dinner.

PRESIDENTS

de Jevane, S. M.

Drijenko, T. K.

MEMBERS

The General Secretary of the Congress.

Tcharnomski, W. H.

Djiorgouli, D. K., Directeur de la Chancellerie du Conservatoire de Musique.

Rounkiévitch, M. G., Chef de Section de l'Administration Générale des Postes et Télégraphes.

VI. — Exhibition Committee

• Organisation of an exhibit of models, charts, maps, plans and other articles pertaining to Inland Navigation, Maritime Navigation and Agricultural Hydraulics.

PRESIDENTS

Mangouby, M. S.

Schokalski, J. M.

MEMBERS

The General Secretary of the Congress.

Andréevsky, N. N., Inspecteur de la Navigation.

Bogoslavski, J. P., Lieutenant-Colonel de l'Amirauté.

Boiarski, A. C., Général-Major de l'Amirauté.

Borkovski, V. A., Rédacteur à la Direction de la Statistique et de la Cartographie.

Boubnoff, N. L., Général-Major de l'Amirauté.

Breitfuss, L. L. Chef de l'Expédition de Mourman.

Djiorgouli, D. K., Directeur de la Chancellerie du Conservatoire de Musique.

Gitcoff, S. M. Ingénieur des Voies de Communication.
Ivanina, A. N. Ingénieur des Voies de Communication.
Lébédéff, L. E.
Offenberg, V. C., Ingénieur des Constructions Navales.
Petrovsky, N. A.
Tchetvieroukhine, B. M., Lieutenant de la Marine.
Toukholka, V. V., Ingénieur des Voies de Communication.
Weinberg, S. G., Ingénieur des Mines.

Painter-Sculptor attached to the Committee.

Isenberg, C. V.

VII. — Excursions Committee.

Organising excursions and visits of members of the Congress, as well as compiling information regarding optional trips and excursions.

PRESIDENT

de Timonoff, V. E., Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller d'État actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil supérieur Technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil Supérieur technique au Ministère du Commerce et de l'Industrie, Membre du Comité Hydrologique.

MEMBERS

Ahonen, H. K., Délégué du Gouvernement de Finlande, Directeur de l'excursion de l'Imatra.
Constantinoff, A. A., Directeur de l'excursion des Ports de la mer Baltique.
Emélianoff, S. V., Chef du service des visites de Saint-Petersbourg.
Giroukhine, I. V., Directeur de l'excursion de Kronstadt.
Kleiber, W. H., Ingénieur des Voies de Communication.
Lévandovski, F. I., Directeur de l'excursion du Volga.
Lévandovski, N. F., Chef du Service des visites de Saint-Petersbourg.

Lindqvist, N. N., Délégué du Gouvernement de Finlande, Directeur de l'excursion de l'Imatra.

Mangouby, M. S., Chef du Service des billets à prix réduits.

Masing, H. K. Directeur de l'excursion du Volga.

Merczyng, H. K., Délégué du Comité Administratif pour l'excursion en Finlande.

Nadporojski, V. V., Directeur de l'excursion de Narva.

Orlovski, V. K., Directeur de l'excursion de Schlussembourg.

Roummel, V. I., Directeur de l'excursion des ports de la mer Baltique.

Siémachko, J. I., Directeur de l'excursion des ports de la mer Baltique.

Tchaplyguine, V. A. Directeur de l'excursion de Moscou.

Tchékhovitch, Directeur du voyage-excursion de Kieff-Sébastopol-Odessa.

Tsionglinski, M. F., Ingénieur des Voies de Communication.

Vassilieff, N. A. Chef du Service photographique.

All the Presidents of the local Commissions.

General Secretarial Department

Central service of propaganda for the Congress, enrolment of members, letters and correspondence, accounts, distribution of tickets, editing proceedings of the Organising Commission, editing the Congress handbook, editing the *Congress Bulletin* which appeared during the period of organisation, editing the *Journal du Congrès*, which appeared whilst the Congress was being held, editing the proceedings of the general meetings and of excursions, etc.

GENERAL SECRETARY OF THE CONGRESS

When the Organising Commission for the XIth International Navigation Congress was appointed in 1906, the functions of General Secretary of the Congress were entrusted to Mr. V. E. de Timonoff. On the death, in 1907, of Mr. M. N. Ghercévanoff, President of the Organising Commission, Mr. de Timonoff was appointed in his stead and at the same time he was good enough to continue to carry out his duties as General Secretary of the Congress, so that no further change was necessary in the management of this department.

SECTIONAL SECRETARIES

Tsionglinski, M. F., Ingénieur des Voies de Communication.
Treniukhinn, V. M., Ingénieur des Voies de Communication.
Treydène, W. H., Rédacteur à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication.

CHIEF ASSISTANTS

Benois, E. A. (Enrolment of members).
Borkovski, V. A., Rédacteur à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication, Secretary of the Exhibition Committee.
Lakerda, V. S., Secrétaire à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication, Secretary of the Lodgings Committee.
Stradetzki, B. A., Lieutenant de la Marine (In charge of the Service of distribution of maps, badges, printed information, publications, etc.).
Toukholka, V. V., Ingénieur des Voies de Communication, Secretary of the Commission.
Tolmatcheff, E. A. (In charge of the correspondence in Russian, French, English, German, Italian, Spanish and Swedish).

EDITOR OF THE « JOURNAL DU CONGRÈS »

Gérardin, Rédacteur en Chef du *Journal de Navigation*.

OTHER ASSISTANTS

Babitch.	Miasnikoff.
Blumenthal.	Müller, L.
Chaffalovitch.	Riabinkine.
Dannenberg.	Rymdzevicz.
Hodjach.	Sadkovski.
Konossiévicz.	Schleifer.
Kosyreff.	Tcherménine.
Kotelski.	Voitkevicz.
Lévacheff.	

Ladies' Committee

PRESIDENT

M^{me} Schaffhausen-Schönberg-Eck-Schaufuss, L. I., Wife of
S. E. Monsieur le Ministre des Voies de Communication.

MEMBERS

M^{mes} Emélianoff , V. P.	M^{mes} Müller , L. T.
Guérassimoff , E. N.	Pariso-de-la-Vallette , V. I.
Guersévanoff , V. D.	Schokalsky , L. I.
Haesehus , E. A.	Timonoff, de , E. A.
Iakovleff , A. M.	Toukholka , M. N.
Ivanina , Z. M.	Valouiéff , O. A.
Lwoff , V. I.	

SECRETARIES

Goulkevitch, L. O., Capitaine de Frégate.
Mikhailoff, D. S., Capitaine de Frégate.

Local Commissions

ARCHANGEL

PRESIDENT

Leitsinger, J. I., Maire de la ville.

HONORARY MEMBERS

Sosnovski, I. V., Gouverneur de la province d'Arkhangel.
Leitsinger, I. I., Maire de la Ville.
Hoevelaken, V. V., Président du Comité de la Bourse.
Charvin, N. I., Conseiller de Commerce.
Sourkov, A. I.,
Valnev, A. I.

MEMBERS

Bourkov, I. I., Délégué de la ville.
Krilitchevsky, M. A., Délégué de la ville.
Lemiakoff, N. F., Délégué de la ville.
Mineiko, G., Délégué de la ville.
Schergold, E. I., Délégué de la ville.
Teliatieff, V. V., Délégué de la ville.

BAKU

PRESIDENT

Raevski, N. V., Maire de la ville.

MEMBERS

Feigl, A. M.
Taghianosoff, S. S.
Goukassoff, A. O.
Skrepitski, F. F.
Kalantar, G. A.
Helius.
Davydoff, V. V.
Sobolevski.

Masloff.
Beboutoff, Ingénieur.
Lessner.
Grigorieff, Ingénieur.
Bokoff, Ingénieur.
Godjinski, Ingénieur.
Philippeo, M. M., Ingénieur.
Ploebko, J. K., Ingénieur.

BATUM

PRESIDENT

Andronikoff, Prince, Maire de la ville.

MEMBERS

Jourouli, G. D.
Sakhnovski, B. V.
Rakovitza, G. G.
Schutz, P. K.

Triantaphyllides, T.
Dounine, S. Z.
Dekanozov, A. D.

KIEFF

PRESIDENTS

Diakoff, I. N., Maire de la ville.
Moguilevtseff, Président du Comité de la Bourse.
Protassieff, V. A., Chef des Voies de Communication de la Région de Kieff.

MEMBERS

Margoline, D. S.
Tchékhovitch, P. S., Professeur à l'Institut Polytechnique de Kieff.
Tchoubinski, Ingénieur des Voies de Communication.

LIBAU

PRESIDENTS

Dreyersdorff, V. A., Maire de la ville.
Schnobel, N. E., Président du Comité de la Bourse.
Siémaschko, J. I., Conseiller d'État actuel, Ingénieur des Voies de Communication, Chef des travaux du port du Libau.

MEMBERS

de Bour, B., Président du Yacht-Club « Nord ».
Depp, S. N., Colonel, Ingénieur, Chef du Génie Militaire du port.
Hahn, I. I., Secrétaire du Comité de la Bourse.
Hill, K. A., Consul d'Angleterre.
Fanagorsky, P. A., Ingénieur, Chef de la 1^{re} section du chemin de fer de Libau-Romny.
Koundt, B., Consul d'Allemagne.
Saritcheff, V. F., Capitaine de frégate.
Schmidt, G., Consul de France.
Smith, I., Consul des Etats-Unis d'Amérique.
Zamkoff, A. V., Colonel, Chef du port commercial.

MOSCOW

PRESIDENT

Tchaplyguine, V. A., Conseiller d'Etat actuel, Ingénieur des Voies de Communication, Chef des Voies de Communication de la Région de Moscou.

HONORARY MEMBER

Roerberg, J. F., Ingénieur des Voies de Communication, Conseil-
ler privé.

MEMBERS

Reichman, S. A., Ingénieur des Voies de Communication.
Biemann, M. I., Ingénieur.
Werne, J. I.
Golovnine, D. N., Ingénieur des Voies de Communication.
Hopper, S. V.
Goujon, J. P.
Johannsen, R. F.

Karelskikh, C. P., Ingénieur.
Kiefer, L. H., Ingénieur.
Kouroff, N. A.
Liphardt, G. E., Ingénieur.
Lvoff, N. G., Chambellan à la Cour de Sa Majesté.
Lioubimoff, J. M., Ingénieur.
Von Meck, A. K.
Paoutynski, A. P., Ingénieur.
Mestcherski, A. P., Ingénieur des Mines.
Rosenblum, A. G., Ingénieur.
Tiapkine, N. D., Ingénieur des Voies de Communication.
Chovgenoff, J. A., Ingénieur des Voies de Communication.
Speyer, V. K., Ingénieur.
Engelmeyer, P. K., Ingénieur.

NARVA

PRESIDENT

Tatarine, A. I., Maire de la ville.

MEMBERS

Dickhof, E. E., Secrétaire de la Délégation de la ville.
Milovanovitch, E. S., Délégué de la ville.
Tchougounoff, T. I., Délégué de la ville.
Spiess, V. A., Membre de la Délégation de la ville.
Tchougounoff, S. I.
Cottam, G. J., Directeur de la Manufacture de Kroenholm.
Crick, A. K.
Zinovieff, L. A.
de Vries, L. D., Vice-Consul des Pays-Bas.
Kogneff, V. P.
Kogneff, A. P.
Hahn, A. F., Conseiller d'Etat actuel.
Petkévitch, S. J., Chef de la police de Narva.
Wrede, A. L., baron.
Boutkévitch, N. V., Chef du port de Narva.
Poutiline, C. I.
Dickhoff, T. N., Consul d'Allemagne.
Doorfeldt, P. T., Président de la Section de Narva de la Société Impériale de Sauvetage des naufragés.
Stavrovski, Ingénieur des Voies de Communication.

NIJNI-NOVGOROD

PRESIDENTS

Mémorski, Maire de la ville.
Sirotkine, Président du Comité de la Bourse.
Bekhtéreff, N. P., Ingénieur des Voies de Communication, Chef des Voies de Communication de la section Nijni-Novgorod de la Région de Kazan.

HONORARY MEMBERS

Chramtchenko, M. N., Gouverneur de Nijni-Novgorod.
Birioukoff, S. I., Vice-Gouverneur de Nijni-Novgorod.
Proutchenko, S. M., Maréchal de la Noblesse.
Kalouguine, W. D., Président de la Zemskaja Ouprava du Gouvernement de Nijni-Novgorod.
Zvantseff, A. N. Membre de la Zemskaja Ouprava.
Démidoff, P. A., Membre de la Zemskaja Ouprava.
Alexandroff, D. U., Membre de la Zemskaja Ouprava.
Medvédeff, S. P., Membre de la Zemskaja Ouprava.
Ostafieff, A. A., Président de la Zemskaja Ouprava et Maréchal de la Noblesse du district de Nijni-Novgorod.
Smirnoff, V. N., Membre de l'Ouprava du district de Nijni-Novgorod.
Kotelnikoff, N. N., Membre de l'Ouprava du district de Nijni-Novgorod.
Lavrentieff, I. D., Membre de l'Ouprava du district de Nijni-Novgorod.
Moskvine, N. D., Directeur des usines de Sormovo.
Makaroff, V. A., Directeur des Voies de Communication de la Région de Kazan.

MEMBERS

Volkoff , N. I.	Morozoff , P. M.
Kazanski , T. V.	Kholodkoff , M. S.
Lelkoff , P. I.	Chichoff , N. N.

ODESSA

Moïsséieff, N. I., Maire de la ville.
Anatra, A. A., Président du Comité de la Bourse.
Poehl, N. V., Ingénieur en Chef des ports de la Novorossia.

REVAL

PRESIDENTS

Gérard de Soucanton, E. A. (Baron), Président du Comité de la Bourse et Vice-Consul d'Angleterre.

Lender, V. A., Maire de la ville.

Roummel, L. I., Conseiller d'État actuel, Ingénieur des Voies de Communication, Chef des travaux du port de Réval et des recherches dans les ports de la mer Baltique.

MEMBERS

Galnbek, E. K., Consul de Danemark et Vice-Consul de Suède.

Hoeppener, E. L., Membre du Comité de la Bourse et Agent du Consulat français.

Degio, E. I., Vice-Président du Comité de la Bourse.

Felman, R. K., Commandant du brise-glace *Iermak*.

Koch, A. A., Consul des Pays-Bas.

Koch, N. A., Membre du Comité de la Bourse et Consul d'Allemagne.

Luter, C. A., Membre du Comité de la Bourse et Consul d'Autriche.

Roterman, C. C., Agent du Consulat américain.

Sheel, G. G., Membre du Comité de la Bourse et Agent du Consulat italien.

Vietinghof-Scheel (Baron), Chef du port de Réval.

Seesemann, A. A., Vice-Consul de Norvège.

RIGA

PRESIDENTS

Armitstede, G. I., Maire de la ville.

Constantinoff, A. A., Conseiller d'État actuel, Ingénieur des Voies de Communication, Chef des travaux du port de Riga.

Larsson, A., Président du Comité de la Bourse.

MEMBERS

Erhardt, J.

Schmelling, R., Architecte.

Lehmann, E.

Dahlfeldt, J.

Blumenbach, A.

Karlberg, N.

v. Bulmering, V.

Laboutine, I.

v. Rennenkampff, D., Ingénieur en chef.

ROSTOV-ON-THE-DON

Khmelkoff, E. N., Maire de la ville.

MEMBERS

Gorbatcheff, P. F., Ingénieur.

von der Weide, Chef du port de Commerce, Conseiller d'Etat.

Grekkoff, S. S., Président du Comité fluvial.

Jonsen, C. C., Président de la Commission pour la construction du quai.

Kouzmine, R. F., Colonel en retraite.

Osten-Saken, A. A., baron, Adjoint du chef du port de Commerce.

Paramonoff, E. T., Président du Comité de la Bourse.

Raevski, R. F., Ingénieur, Conseiller d'État.

Tolmatcheff, F. F., Ingénieur.

Feldmann, A. I., Conseiller de la Cour.

RYBINSK

PRESIDENTS

Kariakine, Conseiller de Commerce, Président du Comité de la Bourse.

Rastorgouieff, M. K., Maire de la ville.

SEBASTOPOL

Maximoff, A. A., Maire de la ville.

SAINT PETERSBURG-KRONSTADT

PRESIDENT

Giroukhine, J. V., Conseiller d'État actuel, Ingénieur des Voies de Communication, Chef des travaux des ports de Saint-Petersbourg et de Narva.

MEMBERS

Dollar, E. I.,

Komeloff, M. M., Directeur de la Société de Navigation de la ligne Saint-Petersbourg-Pétrozavodsk.

Schavernovski, V. P., Ingénieur Supérieur du Corps des Ingénieurs des travaux maritimes.

Vassilieff, N. A., Ingénieur des Voies de Communication.

SAINT PETERSBURG-SCHLUSSELBOURG

PRESIDENT

Orlovsky, V. C., Conseiller d'État actuel, Directeur des Voies de Communication de la Région de Saint-Petersbourg.

TCHEREPOVETZ

PRESIDENT

Le Maire de la ville.

TSARITSINE

PRESIDENT

Scislavski, Chef de Section du Service de la Navigation du Volga.

MEMBERS

Egoroff , N. S.	Iskidaroff , S. I.
Sindarovski , J. F.	Pirogoff , J. A.
Botcharoff , N. K.	Kolessoff , V. I.
Brestchenski , V. A.	Tipkoff , V. P.
Golembievski , A. A.	Savitski , P. A.
Litvak , N. V.	Melnikoff , V. S.
Maximoff , J. V.	Kanavine , T. M.
Serebriakoff , G. N.	Saitsevki , V. A.
Gerhardt , A. K.	Goutovski , A. I.
Lapchine , B. F.	Piatakoff , J. I.
Krouglikoff , B. A.	

VILNA

PRESIDENT

Gounevitch, V. M., Conseiller d'État actuel, Directeur des Voies de Communication de la Région de Vilna.

MEMBERS

Proudnikoff, Ingénieur des Voies de Communication.
Odynet, Ingénieur des Voies de Communication.
Zamblovski, Ingénieur-Constructeur.

WARSAW

PRESIDENT

Hoerschelmann, de, E. F., Conseiller d'État actuel, Directeur des Voies de Communication de la région de Varsovie.

ADDITIONAL PRESIDENT

Kvicinski, L., Conseiller d'État actuel, Inspecteur et Membre de l'Administration des Voies de Communication de la Région de Varsovie.

MEMBERS

Dickmann, L., Conseiller d'État, Chef de la Section Technique à l'Administration des Voies de Communication de la Région de Varsovie.

Guerquin, C., Ingénieur à l'Administration des Voies de Communication de la Région de Varsovie.

Mischké, G., Conseiller d'État, Inspecteur et Membre de l'Administration des Voies de Communication de la Région de Varsovie.

Tsvietkovski, C., Ingénieur à l'Administration des Voies de Communication de la Région de Varsovie.

Vdovikovski, M., Conseiller de Collège, Chef de Bureau à l'Administration des Voies de Communication de la Région de Varsovie.

Kurcysz, L., Conseiller de Collège, Chef du 3^{me} district du Service fluvial de la Vistule.

Delegates of Governments and Corporations

GERMANY

A. — *Regierungsvertreter.*

von Coels von der Brügghen, (Freiherr) Dr., Unterstaatssekretär im Ministerium der Oeffentlichen Arbeiten zu Berlin.

von der Hagen, O., Wirklicher Geheimer Oberregierungsrat, Ministerialdirektor im Ministerium für Handel und Gewerbe zu Berlin.

von Dœmming, A., Oberbau- und Ministerialdirektor im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Germelmann, W., Geheimer Oberbaurat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Bredow, T., Geheimer Oberregierungsrat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Kisker, W., Geheimer Oberregierungsrat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Fecht, C. E., Geheimer Oberregierungsrat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Symphor, L., Dr. Ingenieur, Geheimer Oberbaurat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Nolda, K., Geheimer Oberbaurat und vortragender Rat im Ministerium für Landwirtschaft, Domänen und Forsten zu Berlin.

Gerhardt, P., Geheimer Oberbaurat und vortragender Rat im Ministerium der Oeffentlichen Arbeiten zu Berlin.

von Bartsch, W., Geheimer Ober- und Regierungsrat und vortragender Rat im Ministerium für Handel und Gewerbe zu Berlin, K.-Preussischer Rheinschiffahrtsbevollmächtigter.

Michaelis, G., Dr., Oberpräsidialrat, Geheimer Oberregierungsrat zu Breslau.

Moench, Geheimer Baurat und vortragender Rat im Reichs-Marine-Amt zu Berlin.

Engel, K., Geheimer Regierungsrat und vortragender Rat im Ministerium für Handel und Gewerbe zu Berlin.

Krause, Dr., Geheimer Justizrat, Vice-Präsident des Preussischen Abgeordnetenhauses zu Berlin.

Wiegand, Dr., Generaldirektor des Norddeutscher Lloyd zu Bremen.

Scholer, Geheimer Baurat, Mitglied des Kaiserlichen Kanalamts zu Kiel.

Schmidt, Geheimer Baurat, vortragender Rat im K.-Sächsischen Finanzministerium zu Dresden.

Engels, H., Professor, Geheimer Hofrat, Professor an der Technischen Hochschule zu Dresden.

Gugenhan, M., Baurat in der dem K. Württembergischen Ministerium des Innern unterstellten Abteilung für den Strassen- und Wasserbau zu Stuttgart.

Rehder, P., Dr. Ing., Oberbaudirektor, zu Lübeck.

Bubendey, F., Geheimer Baurat, Wasserbaudirektor zu Hamburg.

Fecht, Wirklicher Geheimer Oberbaurat zu Strassburg i/E.

Biemann, Kais. Deutscher General Consul zu St. Petersburg.

Flamm, Geheimer Regierungsrat, Professor an der Technischen Hochschule zu Berlin.

Scholz, Vice-Consul, Attaché au Consulat général d'Allemagne, à Saint-Petersbourg.

B. — Amtliche Teilnehmer.

Moeller, Hafenbaudirektor zu Wilhelmshaven.

Rollmann, Hafenbaudirektor zu Wilhelmshaven.

Hermann, Oberbaurat zu Essen.

Hamel, Oberbaurat zu Breslau.

Gersdorff, Oberbaurat zu Danzig.

Pruesmann, A., Oberbaurat zu Hannover.

Lindner, Oberbaurat zu Potsdam.

Volkmann, M., Geheimer Baurat zu Hannover.

Lindenberg, F., Regierungsrat zu Stettin.

Wilhelms, Geheimer Baurat zu Köslin.

Rasch, Regierungsrat zu Lüneburg.

Juzi, F., Dr., Regierungsrat zu Stade.

Bindenmann, Regierungs- und Baurat zu Berlin.

Niese, A., Regierungs- und Baurat zu Stralsund.

Nakonz, Ch., Regierungs- und Baurat zu Potsdam.

Schuette, Professor an der Technischen Hochschule zu Danzig.

Mentz, Professor an der Technischen Hochschule zu Danzig.

Schultze, T. W. O., Professor an der Technischen Hochschule zu Danzig.

Müller, P., Professor an der Technischen Hochschule zu Berlin.

Goltermann, Regierungs- und Baurat zu Hannover.

Huettenheim, H., Dr., Regierungsrat zu Hannover.

Ottmann, E., Regierungs- und Baurat zu Duisburg-Ruhrort.

Duesing, Rheinschiffahrtsinspektor, Regierungs- und Baurat zu Coblenz.

Schnapp, F., Regierungs- und Baurat, beschäftigt im Ministerium der Oeffentlichen Arbeiten zu Berlin.

Fraenzel, K., Direktor der Kgl. Maschinistenschulen zu Stettin.

Skalweit, O., Wasserbauinspektor zu Swinemünde.

Suling, E., Baurat zu Bremen.

Winter, P., Direktor der Staatskaiverwaltung zu Hamburg.

Schemmel, B., Baurat, Wasserbauinspektor, zu Strassburg i/E.

C. — Sonstige Teilnehmer.

- Bassermann**, E., Stadtrat, Rechtsanwalt, Vertreter der Stadt Mannheim.
- Bartsch**, Dr., Syndikus des Vereins zur Wahrung der Rheinschiffahrtsinteressen zu Duisburg-Ruhrort.
- Beumer**, W., Generalsekretär des Vereins zur Wahrung der gemeinsamen wirtschaftlichen Interessen in Rheinland und Westfalen.
- Bovermann**, H., Oberbürgermeister, Stadtbaurat in Dortmund.
- Broemel**, M., Rentner, Abgeordneter zu Berlin.
- von Dziembovski**, S., Mitglied des Herrenhauses, Vertreter des Provinzial-Verbands von Posen.
- Gretschel**, R., Landesbaurat, Vertreter des Provinzial-Verbands von Schlesien.
- Hoff**, L., Fabrikdirektor, Vertreter der Handelskammer zu Harburg a. d. E.
- Ianssen**, H., Direktor der Bergwerksgesellschaft Trier zu Hamm i. W.
- Keppler**, J., Oberbürgermeister, Stadtbaurat in Heilbronn.
- Meck**, B., Konsul, Vertreter des Vereins für Hebung der Fluss- und Kanalschiffahrt in Bayern.
- Muelberger**, Oberbürgermeister zu Esslingen a. N.
- Muelberger** (M^{me}), Esslingen a. N.
- Ragoczy**, E., Generalsekretär des Centralvereins für Hebung der deutschen Fluss- und Kanalschiffahrt.
- Rösing**, J., Syndikus, Vertreter der Handelskammer, zu Bremen.
- Schmidt**, G., Direktor des Hafenamts zu Dortmund.
- Müller**, H., Kgl. Geheimer expedierender Sekretär.
- Neminar**, E. K., Baurat.
- Contag**, M., Vorstandsmitglied des Centralvereins für Hebung der deutschen Fluss- und Kanalschiffahrt.
- Eschenburg**, H., Kaufmann, Vertreter der Handelskammer zu Lübeck.
- Benduhn**, C., Stadtbaurat, Vertreter des Magistrats der Stadt Stettin.
- Middeldorf**, W., Baurat, Vertr. der Emscher-Genossenschaft.
- Hansel**, F., Oberbaurat, Oderstrombaudirektor.
- Boethke**, Hauptmann zu Berlin-Schöneburg.
- Freymark**, Dr., Handelskammersyndikus zu Breslau.
- Risser**, K., Bauamtman zu Speyer.
- Krauze**, M. A., Fabrikbesitzer zu Charlottenburg.

Roettger, Direktor der Kanalisationswerke zu Königsberg.
Erlenbach, R., Vertr., des V. für Heb. der D. F. K. S.
Porr, L., Consul, Vertreter des Ostpreussischen Vereins für
Hebung der Fluss- und Kanalschiffahrt.

ARGENTINA

Lange, E., Ingénieur.
Barzi, E. P., Ingénieur en chef de la Commission du Rio de la Plata.
Jolly, G., Ingénieur.
Schickendantz, E., Ingénieur.
Henri, J., Ingénieur.

AUSTRIA

K. K. Handels-Ministerium.

von Fries, A., K. K. Hofrat, Ministerialrat.
Kautzky, H., D^r, Hofrat.
Roubik, Bauoberkommissär.
Schrekenthal, P., Ministerialvizesekretär.
Worms, S., Ministerialsekretär.
von Schneller, O. K. K., Oberbaurat.

K. K. Ackerbau-Ministerium.

Deutsch, V., D^r, Sectionsrat.

K. K. Eisenbahn Ministerium.

Krasny, A. D., Sectionsrat.

Donau-Regulierungs-Kommission.

PRESIDENT OF THE DELEGATION

Kilmansegg, Graf, Erich, K. K. Wirklicher Geheimrat, K. K. Stadthalter im Erzherzogtum Oesterreich u. d. Enns. Vorsitzender Stellvertreter der Donau-Regulierungs-Kommission.

MEMBERS

Fischer, A., K. K., Bezirkshauptmann.
Herbst, Arthur, K. K. Oberbaurat.
Steiner, Léopold, Oberkurator.

Gregorig, Josef, Abgeordneter.
Süsse Milch, Wilhelm, Oberbaurat.
Neumayer, Joseph, D^r, Vizebürgermeister.
Eigner, Franz, Gemeinderat.
Gräf, Franz, Gemeinderat.
Oppenberger, Wenzel, Stadtrat.
Bozdech, Gustav, K. K. Oberbaurat (oder **Halter**, Rudolf,
K. K. Baurat).

Landes-Ausschuss der Markgrafschaft Mähren zu Brünn.

Sileny, W., D^r, Landes-Ausschuss-Beisitzer.
Sebesta, F., Oberlandesrat.
Wolfschuetz, J., Landes-Baurat.

Landesausschuss des Erzherzogtums Oesterreich a. d. Ems.
von Pirko, F.,

K. K. Hydrographischer Zentralverein in Wien.

Lauda, K. K., Ministerialrat.

Landesausschuss des Erzherzogtums Oesterreich unter d. Enns.
Mayer, J., Reichsrat, Abgeordneter.

*Kommission für die Kanalisierung des Moldau- und Elbeflusses
in Böhmen.*

Goldbach, J., Ministerialrat.
Russ, V., D^r, Mitglied des Herrenhauses.

Zentral-Verein für Fluss- und Kanalschiffahrt in Oesterreich.
von Schneller, O., Edler, K. K. Oberbaurat.
Suppan, G. V., General-Inspektor.

Erste K. K. priv. Donau-Dampfschiffahrtsgesellschaft.
Suppan, G. V. Schiffahrts-Generalinspektor.

Oesterreichischer Ingenieur- und Architektenverein.
Bosdech, G. K. K., Oberbaurat und Strombaudirektor.

Prague Municipal Council.

Vlcek, C., Architecte.

Zverina, F., Ingénieur.

Deutscher Polytechnischer Verein in Böhmen.

Rippl, W., Professor an der K. K. Deutschen technischen Hochschule in Prag.

Schoenbach, V., Dr., Direktor der Maschinenfabrik vorm. Breitfeld, Danek & Co. in Karolinenthal bei Prag.

Brand, E., Architekt.

Karpeles, L., Oberingenieur der böhmisch-mährischen Maschinenfabrik in Lieben bei Prag.

Deutscher Ingenieur-Verein in Mähren.

Wolfschütz, J., Mährischer Landesoberbaurat in Brünn.

Commission für Verkehrsanlagen in Wien.

Lobmeyr, O. K. K. Hofrat.

Export-Verein zu Wien.

Schwarz, Adolf, Sekretär.

Ingenieur- und Architekten-Verein in Böhmen.

Scharz, Z., Ingénieur.

Zverina, F., Ingénieur.

Müller, B., Ingénieur.

BAVARIA

Moy (comte de), Envoyé extraordinaire et Ministre plénipotentiaire de Bavière en Russie.

BELGIUM

Royal Government.

Helleputte, G., Excellence, Ministre des Chemins de fer, Postes et Télégraphes, Ingénieur Honoraire des Ponts et Chaussées, Président de l'Association.

Hubert, L., Ingénieur, Membre de la Chambre des Représentants.

Troost, Directeur Général des Ponts et Chaussées.

Vander Linden, J. F., Ingénieur en Chef Directeur des Ponts et Chaussées, Administrateur Inspecteur de l'Université de Gand.
Dufourny, A., Ingénieur en Chef Directeur des Ponts et Chaussées, Secrétaire Général de l'Association.
Grenier, L. Ingénieur en Chef Directeur des Ponts et Chaussées.
Richald, J., Ingénieur principal des Ponts et Chaussées, Professeur à l'Université de Gand, Doyen de la Faculté des Sciences.

Société Royale Nautique Anversoise.

Lenglez, H., Colonel d'Artillerie en retraite.

Association des intérêts maritimes de la ville de Gand.

de Smet de Naeyer, M., Président.

The town of Antwerp.

Albrecht, Gustave, Echevin du Commerce et de la Navigation.
De Winter, François, Ingénieur, Chef de Service des Etablissements maritimes.

Société Belge des Ingénieurs et des Industriels.

Dufourny, A., Ingénieur en Chef Directeur des Ponts et Chaussées, Membre d'honneur de la Société.

EUROPEAN COMMISSION OF THE DANUBE

Kartamyscheff, P., Délégué Impérial de Russie.
Marheinecke, K. B., Délégué Impérial de l'Allemagne.

CHINA

Tceng-Yien-Chi, Secrétaire de la Légation Impériale de Chine à Saint-Petersbourg.
Liou-Sy-Tchang, Secrétaire de la Légation de Chine, à Bruxelles.

DENMARK

Den Tekniske Forening Kiøbenhavn.

Westergaard, N. V., Directeur des constructions navales.
Jensen, J. A. D., Capitaine de vaisseau, Directeur de la Navigation
Hummel, C. M., Ingénieur.
Lorenz, G., Ingénieur du port de Copenhague.
Vedel, A. P., Ingénieur en chef du port d'Aarhus.

SPAIN

De Uhagon, R., Ingénieur en Chef des Ponts et Chaussées.

Valdes y Humaran, J., Directeur des travaux du port de Barcelone.

De Molini y Ulivarri, Directeur des travaux du port de Séville.

Maese y Pena, M., Directeur des travaux du port de Tarragona.

Cervantes Pinelo, F. Ingénieur, Directeur des travaux d'Almeria.

Brockman y Abarzuza, G., Directeur en chef du Service Central de Signaux Maritimes.

Gorbena, V., Ingénieur en Chef du Corps National des Routes, Canaux et Ports.

*Camara Oficial de Comercio, Industria y Navegacion
de Barcelona.*

Ramos y Cordero, R. Président du Comité de Navigation.

Escalas Chameni, F., Dr., Secrétaire.

Compania Transatlantica de Barcelona.

Ramos y Cordero, R.

Escalas Chameni, F.

Camara Oficial de Comercio de Valencia.

UNITED STATES

Government

Sanford, J. G., Major of the Corps of Engineers.

Cosby, S. Major of the Corps of Engineers.

Bogart, J., Colonel, Civil Engineer.

Ockerson, J. A., Colonel, Civil Engineer, Member of the Mississippi River Commission.

Chapin, F. L., Lieutenant-Commander, Naval Attaché of the American Embassy, Saint Petersburg.

Perilliat, A., Civil Engineer.

American Society of Civil Engineers.

de Timonoff, V. E.

American Society of Mechanical Engineers.

Smith, W. E., Honorary Vice-President.

The Scherzer Rolling-Lift Bridge Co.

Roudnitsky, N. V., Ingénieur des Voies de Communication.

FRANCE

Ministère des Travaux Publics.

Quinette de Rochemont (Baron), Inspecteur Général des Ponts et Chaussées, Directeur des Phares et Balises, Président.

Charguéraud, Conseiller d'État, Inspecteur Général des Ponts et Chaussées, Directeur des Routes, de la Navigation et des Mines.

Claveille, Directeur du Personnel et de la Comptabilité au Ministère des Travaux Publics.

Jozon, Inspecteur Général des Ponts et Chaussées.

Kleine, Inspecteur Général des Ponts et Chaussées, Directeur de l'Ecole nationale des Ponts et Chaussées.

Juncker, Inspecteur Général des Ponts et Chaussées.

Resal, Inspecteur Général des Ponts et Chaussées.

d'Hénouville, Chef de la Division de la Navigation au Ministère des Travaux Publics.

Dusuzeau, Ingénieur en Chef des Ponts et Chaussées.

Voisin, Ingénieur en Chef des Ponts et Chaussées.

Batard Razelière, Ingénieur en Chef des Ponts et Chaussées.

Ducrocq, Ingénieur en Chef des Ponts et Chaussées.

Vidal, Ingénieur en Chef des Ponts et Chaussées.

Babin, Ingénieur en Chef des Ponts et Chaussées.

Cuënot, Ingénieur en Chef des Ponts et Chaussées.

Bourgougnon, Ingénieur en Chef des Ponts et Chaussées.

Armand, Ingénieur en Chef des Ponts et Chaussées.

de Joly, Ingénieur en Chef des Ponts et Chaussées.

Naudé, Ingénieur en Chef des Ponts et Chaussées.

Crahay de Franchimont, Ingénieur en Chef des Ponts et Chaussées.

Lahaussais, Ingénieur des Ponts et Chaussées, Secrétaire adjoint.

Marlio, Ingénieur des Ponts et Chaussées, Secrétaire adjoint.

Ministère de l'Intérieur.

Rouville, H., Inspecteur Général des Ponts et Chaussées.

Ministère de l'Agriculture.

Dabat, Directeur de l'Hydraulique et des Améliorations agricoles.

Flamant, Inspecteur Général des Ponts et Chaussées, Vice-Président de la Commission de l'Hydraulique et des Améliorations agricoles.

Lévy-Salvador, Ingénieur à la Direction de l'Hydraulique et des Améliorations agricoles.

De la Brosse, R., Ingénieur en chef des Ponts et Chaussées de 1^{re} classe.

Ministère de la Marine.

Legay, L., Ingénieur en chef des Ponts et Chaussées, Directeur des travaux hydrauliques de la marine.

Institut de France.

Bertin, L. E., comte, Membre de l'Institut, Directeur des Constructions navales.

Société des Ingénieurs Civils.

de Bovet, A., Administrateur délégué de la Société Générale de Touage et de Remorquage, Vice-Président de la Société Française de Navigation et de Construction Navale.

Decauville, P., Ingénieur, ancien Sénateur.

Mallet, P. A., Ingénieur des Arts et Manufactures, Membre de la Chambre de Commerce de Paris.

Société française des Ingénieurs coloniaux.

de Racouza Soustchewsky, M. C.

*Association des Ingénieurs des Constructions Civiles,
Anciens Elèves de l'Ecole des Ponts et Chaussées de France.*

Levy-Salvador, P., Ingénieur.

Association Technique Maritime.

Bertin, L. E., comte, Membre de l'Institut, Directeur des Constructions Navales.

Société pour l'achèvement des voies navigables en France.

Audiffred, Sénateur, Président.

Papillon, Docteur-Professeur de clinique en retraite.

Société du Gaz de Paris.

Boissière, A., Ingénieur.

*Chambre de Commerce de Béziers et Comité du Sud-Ouest
Navigable.*

Boilève, V., Ingénieur.

Chambre Syndicale de la Marine de Paris.

de Bovet, A., Vice-Président.

Collard, Ingénieur en chef des Ponts et Chaussées, Directeur Général de la Compagnie Générale de Navigation.

GREAT BRITAIN

Royal Government.

Colonel Sir **Charles Moor Watson**, K. C. M. G.; R. E.; C. B.

West-Clare Railway Co of Ireland.

Barrington, Wm.

The Institution of Mechanical Engineers.

Gerebiateff, J. F., Colonel.

GREECE

Royal Government.

Argyropoulos, G., Envoyé Extraordinaire et Ministre Plénipotentiaire de Sa Majesté Hellénique à St-Petersbourg.

Typaldo-Bassia, A., Député, Vice-Président de la Chambre des Députés.

HUNGARY

Handelsministerium.

Egan, Edward, Inspector und Professor in der Schiffahrtssection d. K. Ung. Handelsministeriums.

Kohanyi, Zoltan, Schiffahrtsobersinspector.

Macher, E., Oberingenieur.

K. Ung. Ackerbau-Ministerium.

Farago, L., Sectionsrat, Chef, Stellvertreter der Kön.-Ung. Landes-Wasserbau-Direction.

von Udranszky, J., Technischer Rat.

Maurer, J., Ingenieur.

Toth, de, E., Secretär.

Ungarischer Ingenieur- und Architekten-Verein.

Forbath, Imre, Dr., Ingénieur Civil, Professeur agrégé à l'Ecole Polytechnique.

Raabregulierungs-Gesellschaft.

Biró, A., Directeur.

K. Ungarische Fluss- und Seeschiffahrts-Aktien-Gesellschaft.

Sényi von Nagyunyom, P., Direktor-Stellvertreter.

Société « Atlantica ».

Pollacsek, E., Directeur Général.

Ungarischer Schiffsverkehrsverein.

Farago, L., Ministerial Sektionsrat.

Egan, E., Inspektor.

ITALY

Royal Government.

Maganzini, I., Président de Section au Conseil Supérieur des Travaux Publics.

Coletta, N., Président de Section au Conseil Supérieur des Travaux Publics.

Torri, A., Inspecteur Supérieur du Génie Civil.

Sanjust di Teulada, E., Ingénieur en Chef du Génie Civil.

Valentini, C., Ingénieur en Chef du Génie Civil.

Rota, Colonel du Génie Naval.

Marzolo, Capitaine de frégate de la Marine Royale.

Province of Venice.

Cerutti, G., Presidente della Deputazione Provinciale.

Society of Italian Engineers and Architects, Rome.

Luiggi, L., Président.

Treniukhinn, V. M., Ingénieur des Voies de Communication.

College of Engineers and Architects of Palermo.

Torri, A., Inspecteur Supérieur du Génie Civil.

Camera di Commercio ed Arti di Napoli.

Carpi, A.

Camera di Commercio ed Arti di Palermo.

Mirto, Domenico, Consigliere della Camera.

Comité pour la Navigation Intérieure à Milan.

Silvestri, G.

Società Piscicoltura Lombarda a Milano.

Sancassani, A., Medico oculista.

Comune di Milano.

Sanjust di Teulada, E., Ingénieur en chef du Génie Civil.

Collegio degli Ingegneri ed Architetti di Milano.

Sanjust di Teulada, E., Ingénieur en chef du Génie Civil.

Società Lariana di Navigazione del Lago di Como.

Sanjust di Teulada, E., Ingénieur en chef du Génie Civil.

Il Monitore tecnico di Milano.

Sanjust di Teulada, E., Ingénieur en chef du Génie Civil.

Lega Navale Italiana.

Medici di Marignano, Marchese, G.

Comitato locale per la Navigazione interna a Torino.

Migliardi, G., Président de la Chambre de Commerce de Savone.

Società Anonima Navigazione interna, Milano.

Medici di Marignano, Marchese, G.

Origoni, L., Ingénieur.

Società Anonima Navigazione Fluviale Marittima.

Medici di Marignano, Marchese, G.

Origoni, L., Ingénieur.

Chamber of Commerce of Mantua.

Berni, A., Professeur à Mantoue.

Mantuan Committee for the development of Inland Navigation.

Berni, A., Professeur à Mantoue.

Consorzio per la Navigazione Interna nella valle Padana, Milano.

Silvestri, G.

Consorzio autonomo del Porto de Genova.

Inglese, I., Inspector del Genio Civile.

Rivista Marittima.

Rota, G., Colonel du Génie Naval

JAPAN

Imperial Government.

Inuzuka, Katsutaro, Director of the Bureau of Public Works,
Department of the Interior.

Okino, T., Chief Engineer, Bureau of Public Works, Department
of the Interior.

Myoi, Kusuke, Civil Engineer, Department of the Interior.

Kobashi, Ichita, Councillor, Department of the Interior.

Sakata, Sadaaki, Civil Engineer, Department of the Interior.

Moriama, Keizaburo, Naval Attaché to the Japanese Embassy,
Paris.

Uchida, Kakichi, Director of the Mercantile Marine Bureau,
Department of Communications.

Ishibashi, Ayakiko, Engineer of the Lighthouse Bureau, Department of Communications.

Umemura, Sadaaki, Director of the Marine Bureau, Osaka.

Kawakami.

Suzuke.

MEXICO

Lera, Envoyé extraordinaire et Ministre plénipotentiaire du Mexique en Russie.

MONACO

Government.

Plancher, I., Consul Général à Saint-Petersbourg.

NORWAY

Kristensen, I., Directeur de l'Administration des Eaux et Canaux.

NETHERLANDS

Royal Government.

Déking-Dura, A., Ingénieur en Chef du Provinciaalen Waterstaat.

Wortman, Ingénieur en chef, Directeur du Rijkswaterstaat.

Behrens, K., Professeur à l'Ecole Technique supérieure de Delft, Ingénieur de 1^{re} classe du Rijkswaterstaat.

Koninklijk Institut van Ingenieurs.

Wortman, Ingénieur en chef, Directeur du Waterstaat à Haarlem.

Town of Amsterdam.

Bos, A. W., Directeur des Travaux Publics.

Reigersman, Directeur adjoint.

Town of Rotterdam.

de Jongh, G. J., Ingénieur en chef.

Nobel, C., Ingénieur.

Cool, W., Ingénieur.

Association des Ingénieurs sortis de Delft.

Van Voorst Vader, P. J., Ingénieur.

Werf Gusto, Firma A.-F. Smulders, Schiedam.

Smulders, H., Schiffbauer.

PERSIA

Imperial Government.

Ali-Gouli Khan, Conseiller de l'Ambassade de Saint-Petersbourg.

PORTUGAL

Royal Government.

Mendes Guerreiro, J. V., Inspecteur Général des Travaux Publics

Associação Comercial do Porto.

D'Azevedo Vareta, B. C.

Association of Portuguese Civil Engineers, founded in 1869.

RUMANIA

Government.

Kasimir, G., Ingénieur, Inspecteur général.

Davidesco, comte K., Ingénieur, Inspecteur Général.

Davidesco, comte C., Ingénieur, Inspecteur Général.

Stefanescu, N., Ingénieur en chef.

RUSSIA

Imperial Government.

Miasoïedoff-Ivanoff, V. A., Conseiller privé, Adjoint du Ministre des Voies de Communication.

Saloff, B. V., Conseiller privé actuel, Président du Conseil des Ingénieurs.

Ivanitzki, B. E., Conseiller privé, Sénateur, Adjoint du Chef de la Direction Générale de la Propriété Agricole et de l'Agriculture.

- Tcharykoff**, N. V., Maître de la Cour Impériale, Adjoint du Ministre des Affaires étrangères.
- Bentkovski**, A. K., Conseiller d'Etat actuel, Directeur du deuxième Département du Ministère des Affaires étrangères.
- Lykochine**, N. N., Conseiller d'Etat actuel, Adjoint du Ministre de l'Intérieur.
- Boudzynski**, S. K., Lieutenant-Général, Inspecteur en Chef des Travaux Maritimes au Ministère de la Marine.
- Gortchakoff**, A. N., Conseiller privé, Inspecteur Général des Voies de Communication.
- Agareff**, N. A., Conseiller d'Etat actuel, Chef de l'Exploitation des Voies Navigables.
- Gagarine**, Prince, S. W., Conseiller d'Etat actuel, Chambellan à la Cour, Aide du Chef de la Chancellerie du Ministère de la Cour.
- Hoerschelmann (de)**, E. F., Conseiller d'Etat actuel, Directeur des Voies de Communication de la Région de Varsovie.
- Lipine**, A. N., Conseiller d'Etat actuel, Chef de la Construction des Routes et des Voies Navigables.
- Maximovitch**, N. I., Conseiller d'Etat actuel, Directeur des Routes et des Voies Navigables.
- Merczyng**, H., Conseiller d'Etat actuel, Professeur à l'Institut des Ingénieurs des Voies de Communication.
- Naumoff**, B. N., Conseiller d'Etat actuel, Chef de la Construction des Ports au Ministère du Commerce et de l'Industrie.
- Paltoff**, A. A., Chambellan de la Cour Impériale, Conseiller d'Etat actuel, Directeur de la Chancellerie du Ministère des Voies de Communication.
- Statsenko**, V. P., Général-Major, Ingénieur du Génie Militaire.
- de Timonoff**, V. E., Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller d'Etat actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil Supérieur Technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil Supérieur Technique au Ministère du Commerce et de l'Industrie, Membre du Comité Hydrologique.
- Vilkitski**, A. I., Général-Major, Chef de la Direction de l'Hydrographie.
- Gherassimoff**, N. V., Conseiller d'Etat, Attaché au Cabinet du Ministre des Finances.
- Kasitzine**, D. A., Conseiller d'Etat, Chef Adjoint de Navigation Commerciale au Ministère du Commerce et de l'Industrie.

Senate of Finland.

Sjöman, N. N., Lieutenant-Général, Directeur en Chef de l'Administration du Pilotage et des Phares.

Indrenius, Directeur-Adjoint de l'Administration du Pilotage et des Phares.

Lindberg, Directeur Général des Routes et Canaux.

Snellman, Ingénieur en Chef de la Direction des Routes et Canaux.

Hildén, Ingénieur du District de Saïma.

Lindqvist, G., Chef du Canal Saïma.

Ahonen, A., Ingénieur, Chef du District du Chemin de Fer de Finlande.

Hjelt, Inspecteur de la Navigation.

*Ministry of Ways of Communication, Department of Roads
and Navigable Waterways.*

Lipine, A. N., Conseiller d'Etat actuel, Chef de la Construction des Routes et des Voies navigables.

Agareff, N. A., Conseiller d'Etat actuel, Chef de l'Exploitation des Voies navigables.

de Jevane, S. M., Conseiller d'Etat actuel, Ingénieur des Voies de Communication.

Merczyng, H. K., Conseiller d'Etat actuel, Ingénieur des Voies de Communication.

Moursaïeff, S. K., Chef de Bureau, Professeur à l'Institut des Ingénieurs des Voies de Communication.

Toukholka, V. V., Ingénieur des Voies de Communication.

*Ministry of Ways of Communication,
Department of Charts and Statistics.*

de Timonoff, V. E., Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller d'Etat actuel, Directeur de la Statistique et de la Cartographie et Membre du Conseil Supérieur Technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil Supérieur Technique au Ministère du Commerce et de l'Industrie, Membre du Comité Hydrologique.

Brandt, A. A., Conseiller d'Etat.

Borkovski, V. A., Rédacteur à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication.
Treydène, V. H., Rédacteur à la Direction de la Statistique et de la Cartographie du Ministère des Voies de Communication.

*Scholastic Department
of the Ministry of Ways of Communication.*

Tiapkine, Ingénieur des Voies de Communication.
Golovnine, Ingénieur des Voies de Communication.
Stchelkoff, Ingénieur-Constructeur.
Tchérépanoff, Inspecteur de Navigation.

*Ministry of Ways of Communication.
Local Services of Navigable Waterways.*

a) REGION OF THE AMOUR

Dolgoroukof, M. M., Prince, Directeur.
Fomine, J. N.

b) REGION OF THE CAUCASUS.

Agarkoff, N. N.	Koslovski, N. N.
Andronikoff (le prince).	Kravtchenko, S. S.
Beloserski, M. K.	Markosoff, A. M.
Chardanoff, B. B.	Orlovski, C. V.
Florine, E. V.	Petine, N.
Jivillo, C. T.	Reichenbarch, K. X.
Koutchine, V. S.	Simonoff, A. A.
Koiranski, L. G.	Terachkevitch, J. S.

c) REGION OF KAZAN

Antonoff, N. A.	Kovzan, J. S.
Bekhtéreff, N. N.	Matoussévitch, V. A.
Bérézine, D. T.	Makalinski, N. A.
Chikhoff, N. V.	Makaroff, V. A. , Directeur.
Ianichevski, N. G.	Radsichevski, E. E.
Inge, F. F.	Rasoumoff, J. K.
Jdanoff, T. V.	Vodarski, E. A.
Joukovski, N. N.	Voitkévitch, M. F.
Jurgenson, N. T.	

d) REGION OF KIEFF

Akouloff, K. A.	Mikhaïloff, V. A.
Balinski, V. A.	Ouchinski, K. K.
Baranovski, I. O.	Rosoff, J. V.
Brzeski, V. K.	Sykhine, N. D.
Dzerjanovski, S. V.	Tchoubinski, P. P.
Florine, N. V.	Terpougoff, N. V.
Protassief, V. H., Directeur.	Tiltine, A. N.
Imchénetski, V. V.	Timtchenko, V. D.
Iourguévitch, L. V.	Tolvinski, K. L.
Kouptchinski, N. F.	Vassilieff, A. A.
Kouvidoroff, N. A.	Vislotski, S. A.
Lépéchinski, S. N.	Witte, N. A., Directeur-Adjoint.
Leskévitch, I. A.	

e) REGION OF MOSCOW

Bobyleff, S. M.	Stein, T. A.
Brueling, E. R.	Scheinin, G. V.
Buchholz, G. F.	Tchenzoff, A. S.
Reichmann, S. A.	Tchebycheff, P. P.
Réevksi, R. F.	Tchaplyguine, V. A., Directeur.
Sokolski, N. I.	

f) REGION OF SAINT PETERSBURG

Adlerberg, P. P.	Litovtchenko, C. P.
Bossiatsky, B. A.	Nikolsky, A. H.
Chillo, V. P.	Orlovsky, V. K., Directeur.
Freiburg, E. L.	Ptchelnikoff, B. D.
Herty, H. D.	Roundo, A. M.
Iélaguine, A. A.	Stiebel, J. S.
Khonsky, A. S.	Tillinger, T. A.
Kognovitski, E. I.	Treniukhinn, V. M.
Kouzmine, K. K.	Scherntsoff, V. M., Directeur-Adjoint.
Kokouchine, V. N.	
Lakerda, S. A.	Vichniakoff, V. A.

g) REGION OF TOMSK

Aminoff (baron B. A.), Directeur.	Oulianoff, P. F.
Armfeld, B. K.	Tchernycheff, M. S., Directeur-Adjoint.
Feldman, P. M.	Troubine, K. G.
Ibikowski, S. A.	Tchernicheff, A. I.

h) REGION OF WARSAW.

Alymoff, A. A.	Mironenko-Vassioutinski, K. S.
Dickmann, L. G.	Pouciata, M. A.
Hoerschelmann, de, E. F., Directeur des Voies de Com- munication.	Pirboudagoff, C. E. Pétrovski.
Kvicinsky, Z. I.	Tyszka, L. F.
Kurcius, L.	Tsvietkovski, C. J.
Markoff, A. P.	Vdovikovski, M. B. Zvickel, J.

i) REGION OF VILNA

Gounévitch, V. M., Directeur.	Pétroff, E. R.
Grigorieff, J. G.	Proudnikoff, B. V.
Khalioutine, S. V.	Poppé, V. A.
Lipinski, S. I.	Popoff, S. A.
Moosdorff, B. J.	Trilinski, V. A.
Pravossoudovitch, M. M., Di- recteur-Adjoint.	Tvardovski, P. K.

j) REGION OF VYTEGRA

Akimoff, A. A.	Kaminski, J. K.
Bouchmakine, I. V., Directeur.	Mankovski, S. A.
von Berner, I. I.	Maévski, R. F.
Dlougoch, S. A.	

Catherine Railway.

Maltseff, A. M., Ingénieur.

Moscou-Vindava-Rybinsk Railway Department.

Schuchtan, L. F. **Sviatitski, V. J.**

North Western Railways.

Ivanina, A. N., Ingénieur des Voies de Communication.

Sysrano-Viasemski Railway.

Lopatine, N. A., Ingénieur.

Riasan-Oural'sk Railway.

Vinogradoff, N. A., Ingénieur.

Institute of Engineers of Ways of Communication.

Brandt, A. A., Professeur émérite et Directeur de l'Institut.

de Timonoff, V. E., Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller d'État actuel, Directeur de la Statistique et de la Cartographie, Membre du Conseil Supérieur Technique du Ministère des Voies de Communication, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil Supérieur Technique au Ministère du Commerce et de l'Industrie, Membre du Comité hydrologique.

*High School of the Ministry of Ways of Communication
at Moscow.*

Golovnine, D. N., Ingénieur des Voies de Communication.

Tiapkine, N. D., Ingénieur des Voies de Communication.

Polytechnic Institute of Helsingfors.

Petrelus, A., Dr.

Juselius, A. V., Ingénieur.

Ministry of Marine.

Iretskoi, A. A., Contre-Amiral, Commandant du port de Réval.

Grigorovitch, J. K., Contre-Amiral, Commandant du port de l'Empereur ALEXANDRE III.

Petroff, J. I., Commandant du port de Saint-Petersbourg.

Collands, M. N., Contre-Amiral, Capitaine du port de Sébastopol.

Dabitch, N. D., Contre-Amiral.

Kniazeff, M. V., Contre-Amiral.

Drigenko, T. K., Général-Major.

Vechkourtseff, P. F., Général-Major.

Gross, T. C., Général-Major.

von Spindler, J. B., Général-Major de l'Amirauté.

Ivanoff, B. M., Général-Major.

Radloff, O. L., Général-Major.

Schokalski, J. M., Général-Major.

Zelenoi, A. P., Conseiller d'État actuel.

Roussine, A. I., Capitaine de vaisseau.

Goulkevitch, L. O., Capitaine de frégate.

Moeller, A. P., Colonel.

Berg, B. A., Ingénieur en chef du port de Cronstadt.

Emperor Nicolas I Naval Engineering College.

Paromensky, D. S., Lieutenant-Général.

Ministry of Commerce and Industry. Local Port Services.

Vietinghoff, A. A., baron, Chef du Port de Réval.

Iélaguine, M. A., Chef du Port de Berdiansk.

Neszer, A. S., Ingénieur des Voies de Communication. Port de Vindau.

Potocki, P. N., Ingénieur des Voies de Communication. Port de Kherson.

Port of the City of Saint Petersburg.

Tyrtoff, T. F., Général-Major, Chef de la Police du Port de la ville de Saint-Pétersbourg.

Eastern-Chinese Railway.

Wentzel, A. N., Ingénieur des Voies de Communication.

Department of Military Topography.

Artamonoff, N. D., Général d'Infanterie, Directeur.

Ivanina, A. N., Ingénieur des Voies de Communication

Mining Institute.

Schroeder, J. F., Conseiller d'État actuel, Professeur.

Saint Petersburg Polytechnic Institute.

Boklevsky, Professeur.

Technological Institute of Kharkov.

Kislitzine, N. S., Ingénieur des Voies de Communication.

Polytechnic Institute at Novotcherkassk.

Abramoff, N. M., Ingénieur des Voies de Communication.

*Imperial Geographical Society, Section of Eastern Siberia
at Irkutsk (Sub-section of Krasnoiarsk).*

Vostrotine, E. V., Membre de la Société.

Imperial Geographical Society (Section of the Amour).

Perflieff, V. V., Membre de Conseil de la Section.

Geographical Society of Finland.

Alfthan, M., Colonel, Gouverneur de la province de Nylande.

Free Imperial Society of Economics.

Ototzki, H. V.

Javien, L. I.

Prokopovitch, S. N.

Society for the promotion of Russian Commerce and Industry.

Loransky, A. M., Conseiller privé, Ingénieur des Mines.

Gorenko, A. A., Conseiller d'État actuel.

Imperial Society of rural Economics of Don-Kouban-Terek.

Dénissoff, B. I., Maître des Écuries à la Cour Impériale.

Imperial Society of Navigation.

Mikhailoff, G. I., Lieutenant-Général, Membre honoraire de l'Académie Impériale des Sciences.

Kleiber, W. H., Ingénieur.

Tennyson, G. A., Ingénieur.

Gherassimoff, N. V., Ingénieur.

Polytechnic Society of Saint Petersburg.

von Krusenstern, O. G., Ingénieur, Président.

Society for the protection of Public Health.

Danilevsky, A. S., Conseiller privé, Chef de l'Académie Impériale Militaire de Médecine, Président.

Houbert, W. O., Docteur en Médecine, Président.

Suzor, P. I., Conseiller d'État actuel, Architecte, Président adjoint.

Levacheff, V. A., Docteur en médecine.

Khlopine, Professeur du Cours d'hygiène à l'École de Médecine de Femmes.

Zoueff, A. J., Médecin d'honneur à la Cour Impériale.

Imperial Russian Technical Society (Section of Baku).

Khatissoff, C. I., Président de la Section.

Imperial Russian Technical Society (Section of the Don).

Belitzki, S. O., Ingénieur.

Kisseleff, N. G., Ingénieur.

Imperial Russian Technical Society (Section of Kieff).

Tchoubinski, P. P., Membre effectif de la Société.

Imperial Russian Technical Society (Section of Nijni-Novgorod).

Joukovsky, N. N., Ingénieur des Voies de Communication.

Vorobieff, E. A., Ingénieur.

Imperial Russian Technical Society (Section of Odessa).

Alymoff, V. S., Ingénieur.

League for the renewal of the Russian Fleet.

Beklemicheff, N. N., Général-Major, Président.

Odintsoff, A. I., Président-Suppléant.

Roummel, J. V., Secrétaire.

Russian Naval League.

Verkhovskoi, P. V.

Stock Exchange Committee of Libau.

Schnobel, N. E., Président.

Stock Exchange Society at Moscow.

Krestovnikoff, G. A., Président du Comité de la Bourse.

Stock Exchange Committee of Reval.

Kotnovsky, L. P.

Stock Exchange Committee of Riga.

Pabst, A. E., Ingénieur.

Stock Exchange Committee of Saint Petersburg.

Prozoroff, A. S., Conseiller d'État actuel.

Forostovski, P. P.

Town of Astrakhan.

Serguéieff, Ch. N.

Town of Batum.

Prince Andronixoff, J. Z., Maire de la ville.

Town of Nijni-Novgorod.

Mémorski, A. M., Maire de la ville.

Association of Russian Commerce and Industry.

Lazareff, M. S., Membre du Conseil.

Russian Navigation Company for the Danube.

Kachérininoff, A. P. Vice-Amiral, Président.

Moghilensky, E. A.

« Volga » Navigation Company.

« J. Lioubimoff » Navigation Company.

« Konetski » Navigation Company.

Konetski, J. G.

« Samolet » Navigation Company.

Ratkoff-Rojnoff, J. V.

Finnish Steam Navigation Company.

Massé, C. F., Ingénieur.

« Kavkas et Merkuri » Navigation Company.

Benois, M. N., Directeur.

Mercantile Marine of the Far East.

Sédoff, G. J.

« Kotlas-Archanghelsk-Mourman »

and « Roussko-Vostoczno-Kitaiskoe-Parokhodstvo »

Navigation Companies.

Bénislavsky, M. M., Président.

Oriental Company of Warehouses and Depots.

Mikhaltchevsky, J. D., Ingénieur.

Kryjanovsky, A. A., Directeur.

« Sachsen » Navigation Company.

Kirchner, R. T.

Russian Trade and Navigation Company.

Polouchkine, S. J., Général-Major de la Marine.

« Viatsko-Voljskoé Parokhodstvo » Navigation Company.

Gousseff, P. T.

« Artel de la Bourse » Company, Warsaw.

Krzetchkovski, S. F., Président.

« Felser et Cie » Works at Riga, Saint Petersburg Agency.

Rouleff, V. N., Ingénieur.

« Harfeld » Engineering Company.

Harfeld, O. M., Ingénieur.

Grain Elevator Company for the port of Saint Petersburg.

Omélianovitch, J. S., Directeur.

Floating Elevators Company at Nicolaew.

Windscheid, G. F., Directeur.

Machine Construction Company at Kolomna.

Mestcherski, A. P., Ingénieur des Mines.

E. Liphardt Company at Moscow.

Liphardt, G. E., Ingénieur.

Livonian Society for the improvement of Navigable Waterways

de Berg, comte, T. G., Président.

*Livonian and Esthonian bureau
for the improvement of Agriculture.*

Rosenstandt Weldicke, P., Ingénieur en chef de bureau.

« P. Malioutine & Sons » Industrial and Commercial Company.

Sousline, N. M.

Sandvick Naval Dockyard at Helsingfors.

Runeberg, R. S., Ingénieur Civil.

« Mazout » Industrial Company.

Chatskine, V. S.

Navigation Company for the Volga.

Polak, M. G., Directeur.

Russian Imperial Geographical Society.

Voeikoff, A. I., Membre Honoraire de la Société.

Schokalski, J. M., Président de la Section de la Géographie-Physique.

Dostoïevski, A. A., Secrétaire de la Société.

Fluvial Committee for the Don.

Belitzki, M.

Committee for the Mouths and Entrances of the Don.

Tolmatcheff, T. F., Ingénieur.

« Nobel Brothers » Company.

Nobel, E. L., Conseiller de Commerce.

Mouroz, L. S., Ingénieur.

Lebourdais, G. L., Ingénieur.

Ecklund, G. P., Directeur.

Krussel, J. G., Directeur.

Beliamin, M. M., Ingénieur des Mines.

Hagelin, K. V., Ingénieur.

Company for the Manufacture of Cement.

Paoutynski, S. M., Ingénieur.

« Russia » Insurance Company.

Voig, A. O.

Theakston, J. A.

Penl, R. S.

Insurance Company for the Black Sea.

Morgoulis, M. A., Ingénieur.

SERVIA

Popovitch, D., Envoyé Extraordinaire et Ministre Plénipotentiaire
de S. M. le Roi de Serbie.

SIAM

Government.

du Plessis de Richelieu, Vice-Amiral.

SWEDEN

Royal Government.

Wijnblad, O. J. F., Chef de la Direction Royale des Ponts et
Chaussées, Colonel en Chef du Corps Royal des Ponts et
Chaussées.

Hansen, F. V., Directeur Commandant au Corps Royal des Ponts
et Chaussées.

Richert, J. G., Professeur à la Haute Ecole Polytechnique de
Stockholm.

Brostroem, D., Directeur de la Compagnie Est-Asiatique.

Kongl. Nautisk-Meteorologiska Byran i Stockholm.

Hafen Direction zu Kalmar.

Ek, Karl, Director.

Hafenbauverwaltung d. Stadt Stockholm.

Lundberg, K. A., Ingénieur en chef.

Vattenbyggnadsbyran, Stockholm.

Luebeck, S., Civilingenieur.

Hafendirection zu Helsingborg.

Lange, A. W., Lieutenant des Kgl. Schwedischen und Wasserbau-
corps.

Königl. Commers Kollegium zu Stockholm.

Pihlgren, J. F. H., Abtheilungschef, vorm. Schiffbaudirector der
Königl. Schwed. Marine.

Svenska Technologföreningen.

Magnell, C. J., Professeur.

Brostrøm, D., Membre de la Diète.

K. Technische Hochschule in Stockholm.

Magnell, C. J., Professeur.

Stockholms Handelskammare.

Blomberg, H.

SWITZERLAND

Odier, Ministre plénipotentiaire et Envoyé Extraordinaire de la
Suisse en Russie.

TURKEY

Delegate of the Imperial Ottoman Government.

Roumbeyoglou-Fahreddin-bey, Conseiller à l'Ambassade Impé-
riale à Saint-Pétersbourg.

REGULATIONS FOR THE MEETINGS

OF THE

XIth NAVIGATION CONGRESS

(Approved by the Organising Commission and by the Executive Committee of the Permanent Commission.)

ART. 1. — The detailed programme of the formal inaugural meeting being drawn up by the General Presidency only those shall speak on that occasion who have been previously requested by the General Presidency to deliver a speech.

ART. 2. — The normal duration of the sectional meetings will be three hours. The speakers must conform to art. 16 and 17 of the regulations of the International Association.

ART. 3. — The questions will be discussed in the order indicated on the programme of the disposition of the time.

ART. 4. — The final meeting will, in accordance with art. 18 of the regulations of the Association allow discussion of the resolutions of the sections and voting on these resolutions. Valedictory speeches shall be admitted at the final meeting after the end of the voting. Persons who may wish to speak will kindly send in their names beforehand to the General Secretary. The President may limit the number and the duration of the speeches.

ART. 5. — The discussions may be held in Russian, French, German and English. Interpreters attached to the Office will, at the request of members present, recapitulate in the three other languages speeches delivered in one of the four languages allowed.

ART. 6. — An official report in French will be published by the Office of the Congress containing in addition the resolutions voted at the meetings.

PROGRAMME OF WORK

AND

NAMES OF REPORTERS

VARIOUS PUBLICATIONS

I. Section. -- Inland Navigation.

A. — REPORTS.

1. QUESTION : *Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to subserve the interests of navigation and industry.*
1. **Maximoff**, S. P. — General report.
2. **Deinlein**, A. — Recent designs of movable weirs for the most favourable utilisation of water.
3. **Schnapp** and **Carstanjen**. — The construction of weirs in rivers with considerable variations in their water-level and subject on occasion to strong icedrift, with regard to the interests of navigation and industry.
4. **Cipolletti**, C. — Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to subserve the interests of navigation and industry.
5. **de Timonoff**, V. E., and **Tsionglinsky**, M. F. — Arrangement of weirs with large variations of water-level and occasional strong icedrift with regard to the interests of navigation and industry.
6. **Hansen**, F. V., and **Malm**, G. — Two important weirs on Swedish rivers.
7. **Sibert**, W. L. — Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to subserve the interests of navigation and industry.

2. QUESTION : *Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.*

8. **Merczyng**, M. Ch. — General report.
9. **Marlio**, L. — Study of the economics and regulations for the operating and the mechanical traction of boats on rivers, canals and lakes.
10. **Bredow**, T., and **Teubert**, O. — The economical, technical and legislative examination of mechanical traction and towing monopoly on canals and rivers.
11. **Havestadt**, C. — Proceedings of a special committee of the German-Austro-Hungarian Society of Inland Navigation on the towing monopoly and mechanical ship-traction on canals.
12. **Saner**, J. A. — Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.
13. **Tsionglinsky**, M. F., and **Roundo**, A. M. — Mechanical traction of boats on the Ladoga canals.

3. QUESTION : *Equipment of ports of inland navigation especially the advance made in electric plants.*

14. **Romanoff**, A. D. — General report.
15. **Ottmann**. — Equipment of the inland harbours with more especial reference to progress made in their electric installations.
16. **Bela von Gonda**. — The commercial harbour of Buda-Pesth.
17. **Gervais**, B., and **Tsimbalenko**, L. — Inland navigation ports in Russia.
18. **Sheridan**, R. B. — The equipments of ports on the great inland lakes of North America.

4. QUESTION : *Canals which serve both for navigation and for irrigation.*

19. **Rytel**, M. F. — General report.
20. **Levy-Salvador**, P. — Mixed canals which can be used both for navigation and agriculture.

21. **Buckley**, R. B., and **Brown**, H. — The advantages and disadvantages of canals employed both for irrigation and navigation.
22. **Sanjust di Teulada** E., **Bifulco**, O., and **Cucchini**, E. — On canals which are used jointly for navigation and agricultural purposes.
23. **Toukholka**, V. — Combined canals for the service of navigation and agriculture.
24. **Newell**, F. H. — Canals useful in navigation and agriculture..

5. QUESTION : *Protection of low-lying lands against invasion by water.*

25. **Golovnine**, D. N. — General report.
26. **Troté**, A. — A general study of the various means used in France to protect the land from invasion by water.
27. **von Kvassay**, E. — Flood-prevention and drainage in Hungary.
28. **Rytel**, M. — Preservation of low-lying ground against the inroads of water in the Terek valley.
29. **Ockerson**, A. — Protection of low lying lands against the invading of water. The Level system of the Mississippi River and the protection of Salton Basin.

B. — COMMUNICATIONS.

1. COMMUNICATION : *Application of reinforced concrete to hydraulic constructions.*

30. **Drouginine**, S. I. — General report.
31. **de Préauveau**, A. — Note on the applications of ferro-concrete in subaqueous construction (internal navigation).
32. **Muller**, S. — Employment of reinforced concrete in hydraulic constructions.
33. **Noble Twelvetrees**, W. — Some applications of reinforced concrete to inland navigation works in the United Kingdom.
34. **Wouter Cool**. — Use of reinforced concrete in hydraulic works.
35. **Vosnessenski**, P. — Applications of reinforced concrete to hydraulic constructions.
36. **Carling**, W., and **Lundberg**, A. — Quay walls of reinforced concrete in Stockholm and Norrköping.

2. COMMUNICATION : *Participation of the Government and the various parties interested in the expenses necessary for the development of inland navigation, including, if required, the power to be given to the Government to acquire a part of the land which would be improved in value along new waterways.*

37. **Kounitzky**, S. K. — General report.

38. **d'Hénouville**, M. — Methods of Government intervention as well as various parties concerned in the raising of funds required for the development of inland navigation.

39. **Kisker** and **Ragoczy**. — Co-operation of the Government and of the parties interested in the measures for the development of inland navigation, eventually including that of the concession to the Government of the right of eventually purchasing part of the strip of land which is to be utilized along the banks of a new waterway.

40. **Ivanowsky**, A. V. — Ways in which the Government and interested parties can share in the supplying of funds necessary for the development of inland navigation.

3. COMMUNICATION : *Hydrometric services, prediction of floods and depths of water.*

41. **Kleiber**, W. H. — General report.

42. **Maillet**, E. — Note regarding the present state of the hydrometric services and announcement of floods in France.

43. **Bindemann**, H., and **Hensel**, J. — Hydrological knowledge and high-water and ice drift reporting service in Germany.

44. **Valentini**, C. — Hydrometric service for recording floods and low water.

45. **Lewandowsky**, F. — The dependence of the water levels of lake Beloosero on atmospheric precipitations in its alimentary basin.

II Section : Ocean Navigation

A. — REPORTS

1. QUESTION : *Fishery harbours and harbours of refuge for the coasting trade.*

- 46. **Rummel**, V. Y. — General report.
- 47. **Wilhelms**. — Fishery harbours and harbours of refuge for the coasting trade.
- 48. **Carey**, A. E. — Fishery harbours and harbours of refuge for the coasting trade.
- 49. **Bottemanne**, J. M., and **Van Oordt**, H. — Dutch fishery harbours.
- 50. **Silitch** — Harbours of refuge for the Russian coasting vessels in the Baltic Sea.

2. QUESTION : *Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.*

- 51. **de Szystovski**, M. A. — General report.
- 52. **de Smet de Naeyer**, M., and **Grenier**, L. — Inland sea-ports and their means of access. Their advantages. Economic and technical study.
- 53. **Vidal**, M. — Inland ports.
- 54. **Rosing**, J., and **Suling**, E. — Inland sea-ports and their approaches. Their advantages. Economic and technical review.
- 55. **Hunter**, W. H. — Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.
- 56. **Orlando**, P. — Inland maritime ports and the means of access thereto.
- 57. **de Timonoff**, V. E. — The maritime ports situated along the large navigable inland waterway between the Baltic Sea and White Sea, and their means of access thereto.
- 58. **Jaba**, A. — The inland sea-ports of the Jenissei and the means of access to them in the light of the results of the special expedition organised in 1905 by the Ministry of Ways of Communication.

59. **Giroukhine, J.** — Inland maritime ports and their approaches.
Their advantages; economic and technical considerations.

3. QUESTION : *Construction of ports on sandy shores.*

60. **Brandt, A. A.** — General report.
61. **Vernon-Harcourt, L. F.** — The construction and maintenance
of sea-ports on sandy coasts.
62. **Lo Gatto, D.** — Construction of harbours on sandy beaches.
63. **Wortman, H.** — Construction of harbours on sandy foreshores.
64. **Ivanina** and **Ekerlé.** — The most important Russian ports on
the sandy coasts of the Baltic.
65. **Sanford, J. J.** — Construction of ports on sandy shores. Ports
of the United States on the Atlantic Ocean, Gulf of Mexico,
Pacific Ocean and the Great Lakes.

4. QUESTION : *General conditions for the security of maritime
navigation.*

66. **de Schokalsky, J. M.** — General report.
67. **Rota, G.** — General conditions for the security of navigation.
68. **Anfimoff, W.** — General conditions of maritime navigation
and of luminous signals.
69. **de Schokalsky, J. M.** — The general conditions influencing
the safety of maritime navigation.
70. **de Timonoff, V. E.** — The auto-salving of stranded vessels.
71. **Spitzin, W.** — General conditions for the security of maritime
navigation.

5. QUESTION : *Hydrographic exploration of the seas.*

72. **Mordovine, K. P.** — General report.
73. **Marzolo, P.** — Report on the present conditions of Italian
hydrography.
74. **Maximoff, S.** — Present state of the exploration of the Baltic
sea from the point of view of safety of navigation.
75. **Mordovine, K.** — Hydrographic studies of seas.

B. — COMMUNICATIONS.

1. COMMUNICATION : *Appliances for repairs (dry docks, floating docks, lifting apparatus, etc.).*
76. **Tréniukhinn**, W. M. — General report.
77. **Barbé**, J. — Dry docks recently constructed in France and at its naval bases.
78. **Asmussen**, G. — Docks. Dry docks, floating docks, lifting apparatus, etc.
79. **Nobel**. — Floating dock N° 4 of the city of Rotterdam.
80. **Bieliawin**, L. — The dry docks in the Emperor Alexander III harbour.
81. **de Timonoff**, V. E. -- Temporary dry docks for rapid construction.
82. **Polissadoff**, J. — Dry docks for the repair and construction of vessels.
2. COMMUNICATION : *Best types of sea-going vessels for transporting freight, in their relation to inland navigation ports and waterways.*
83. **Boklevsky**, C. -- General report.
3. COMMUNICATION : *Application of reinforced concrete to maritime works. Means to insure its preservation.*
84. **Abramoff**, N. M. — General report.
85. **Voisin**, J. — The application of reinforced concrete to maritime construction in France. Methods for insuring its preservation.
86. **Moeller**. — Communication relating to the application of hydraulic ferro-concrete to sea-works. Means for its preservation.
87. **Noble Twelvetrees**, W. — Some applications of reinforced concrete to maritime works in the chief ports of the United Kingdom.
88. **Wouter Cool**. — Employment of reinforced concrete for hydraulic constructions. Means for assuring its durability.
89. **Nikolsky**, A. -- Application of reinforced concrete to maritime works.

Report on the most recent works carried out in the principal sea-ports.

- 90. **Iankowsky**, P. — General report.
- 91. **Quinette de Rochemont** (Baron). — Account of the most recent works carried out in the principal seaports of France.
- 92. **Bela de Gonda**. — The Hungarian mercantile marine and the port of Fiume
- 93. **Coen Cagli**, E. — New works in the sea-ports of Italy.
- 94. **Guersevanoff**, N., **Dmitrieff**, V., and **Dratch**, F. — Account of the works most recently carried out at the principal sea-ports.
- 95. **Molini**, L., and **Arenal**, F. — Note on the ports of Spain.

VARIOUS PUBLICATIONS

Publications of the Commission of Organisation.

- 96. L'Indicateur du Congrès.
- 97. Le Guide des excursions du Congrès.
- 98. Le Plan-programme de l'excursion de la Narova.

Publications of the Ministry of Ways of Communication.

- 99. Uebersicht der Binnenschiffahrt in Russland.
- 100. Les Voies navigables intérieures de la Russie.
- 101. La Voie navigable Marie.
- 102. La Neva et les canaux de Ladoga.
- 103. Le Volga.

Publications of the Ministry of Marine.

- 104. Catalogue de l'Exposition du XI^e Congrès international de navigation.
- 105. Aperçu historique et description de Cronstadt, par Dorogoff.
- 106. Précis historique de la Classe et de l'Ecole des Torpilleurs, 1874-1878. Cronstadt, par Gitkoff.

107. Classe des officiers d'artillerie. Cronstadt, par Kazmitcheff.
108. L'Ecole des ingénieurs de la Marine de l'Empereur Nicolas I. Cronstadt, par Podogine.
109. Das Maritime astronomische und Kompass-Observatorium. Cronstadt von Blumbach.
110. L'Ecole des mécaniciens de la flotte de la Baltique. Cronstadt, par Baranzoff.
111. L'Ecole des scaphandriers et les travaux sous-marins, par Kononoff.
112. Aperçu sommaire du développement de la navigation marine en Russie et à l'étranger, par Vinogradoff.
113. Les Usines d'Ijora.
114. L'Usine d'Oboukoff, par Kaptereff.
115. Chantiers navals et Usines mécaniques de la Baltique.
116. Les constructions navales militaires sur les chantiers de l'Etat. Saint-Petersbourg, par Cherchoff.
117. Le Musée de la Marine. Saint-Petersbourg, par Ogorodnikoff.
118. Corps de Marine et Académie navale Nicolas. Saint-Petersbourg, par Maximoff.
119. Aperçu historique sur le développement du service du pilotage en Russie, par Sabo.
120. L'Administration générale de l'hydrographie, par Bialokoz.
121. Die Werkstatt für nautische Instrumente bei der hydrographischen Haupt-Verwaltung, von Achmatoff.
122. Les Ateliers pour la reproduction de la Section cartographique de l'Administration générale hydrographique, par Bialokoz et Janoff.
123. Exploration hydrographique des mers russes. Cartes et instructions nautiques, par Bouchteeff.
124. Aperçu historique du service des phares en Russie, par Pridovsky.

Publications of the Ministry of Commerce and Industry.

125. Aperçu historique sur le développement de la marine marchande russe.
126. Ports de commerce de la Russie d'Europe.

Publications of the Ministry of Agriculture.

127. Travaux hydrotechniques exécutés dans la zone du chemin de fer sibérien.
 128. Travaux de l'expédition occidentale pour l'assèchement des marais de Pinsk.
 129. Travaux d'assèchement des marais de la région septentrionale de la Russie d'Europe.
 130. Conditions et but des travaux hydrotechniques agricoles en Russie.
 131. Travaux hydrotechniques en Turkestan.
 132. Travaux agricoles en Russie.
 133. Travaux d'alimentation en eau et d'irrigation dans le Midi de la Russie.
 134. Sur l'accumulation et la consommation de l'humidité dans le sol des bassins des fleuves de plaines, par E. Oppokov.
 135. La Flotte volontaire russe.
 136. Ligue de rénovation de la flotte.
 137. La Société de navigation du Volga.
 138. Le Port Terminus du Transsibérien, par V. E. de Timonoff.
 139. La Régularisation des rivières par le dragage mécanique, par V. E. de Timonoff.
 140. Le IX^e Congrès international de navigation, par V. E. de Timonoff.
 141. Les Cataractes du Dnièpre, par V. E. de Timonoff.
 142. Les Dragues à succion, par V. E. de Timonoff.
 143. Un Barrage mobile avec des vannes autorégulatrices, par Imchénetski.
 144. Les Voies navigables en Finlande.
 145. Port de Horley.
 146. Le Pont d'Ochla sur la Néva, à Saint-Petersbourg.
 147. Chambre centrale des poids et mesures.
 148. Institut des Voies de communication Empereur Alexandre I, à Saint-Petersbourg.
 149. La glace de fond des rivières et ses effets désastreux durant la congélation, par L. Wladimiroff.
 150. Das Schiffshebewerk « Oelhafen-Löhle ».
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- Visconti Venosta** (M^{me} Françoise), via Boccaccio, 34, Milano (Italie).
- Vislotski**, S. A., Ingénieur des voies de communication, rue Bolchaia Povalnia, 33, Kiev (Russie).
- Vladimiroff**, L., L. Inspecteur de la navigation, Kanonerski péréoulouk, 6, Saint-Petersbourg (Russie).
- Vlodek**, K. L., Ingénieur des voies de communication, Station, Zdolbounovo (Russie).
- Vodinski**, A. A., Starodoub (Russie).
- Vogler**, W., Regierungs-Assessor, Seminarstrasse, Köslin (Allemagne).
- Vogt**, A. O., Société d'Assurances, Morskaia, 37, Saint-Petersbourg (Russie).
- Voisin** (M^{me} Marthe), rue des Vieillards, 32, Boulogne-sur-Mer (France).
- Volkoff**, V. P., Etudiant à l'Institut des voies de communication, Saint-Petersbourg (Russie).
- von Berner**, S. I., 13^{me} ligne, 16, Saint-Petersbourg (Russie).
- von Bünting**, M. G., Directeur-Adjoint de la Chancellerie du Ministère des voies de communication, Russie.
- Von der Hagen**, O., Ministerialdirektor, Kantstrasse, 162, Charlottenburg bei Berlin (Allemagne).
- von Desen**, A. R., Ingénieur des voies de communication, quai de l'Université, 15, Saint-Petersbourg (Russie).
- von Dittmar**, N. F., rue Gubernatorskaia, 7, Kharkov (Russie).
- von Ekesparre**, O. R., rue Michel, 1, Saint-Petersbourg (Russie).
- von Essen**, N. O., Contre Amiral à la suite de Sa Majesté, 2^{me} Ligne, 13, Saint-Petersbourg (Russie).
- von Helfreich**, G. N., port de Poti, gouvernement de Koutaïs (Russie).
- von Krusenstjern**, O. G., Président de la Société polytechnique, rue Arsenalnaia, 12, Saint-Petersbourg (Russie).
- von Meck**, A. K., Bolchoï Afanassievski péréoulouk, 15, Moscou (Russie).
- von Meck** (M^{me} Anna), Oboukhoff, 6, Moscou (Russie).
- von Merkatz**, F., Major, Mannheim (Allemagne).
- von Niedermüller**, A. G., Contre-Amiral, Président du Comité de la flotte volontaire (Russie).
- von Réson**, A.-K., Sénateur, Saint-Petersbourg (Russie).
- von Schwanebach**, Ch. Ch., Saint-Petersbourg (Russie).

- von Spindler**, J. B., Général-Major, 4^{me} ligne, 5, Saint-Pétersbourg (Russie).
- von Stockert** (M^{me} Frederike), Dittergasse, 49, Wien XIX (Autriche).
- von Stockert** (M^{me} Selma), Dittergasse, 49, Wien XIX (Autriche).
- von Wendrich**, A., Adjoint du Ministre des voies de communication, Saint-Pétersbourg (Russie).
- von Zwingmann**, G. G., Ingénieur naval à l'Ecole d'artillerie Michel, Saint-Pétersbourg (Russie).
- Vosnessenski**, P. I., Ingénieur des voies de communication, Touapsé (Russie).
- Voynoff**, N. M., Péetrovsk (Russie).
- Voynovski-Kruger**, E. B., Fontanka, 117, Saint-Pétersbourg (Russie).
- Vroublevski**, S. H., Ingénieur des voies de communication, rue Kirotchnaia, 32-34, Saint-Pétersbourg (Russie).
- Vsévolodoff**, N. F., Directeur du port de Commerce, Krasnovodsk (Russie).
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- Walrond**, P. P., Général-Major de l'Amirauté, Vassili Ostrov, 14^e ligne, 1, Saint-Pétersbourg (Russie).
- Walter**, K., Ingénieur, 2^e ligne, 11, Saint Pétersbourg (Russie).
- Watson** (Lady), 16, Wilton Crescent, London S. W. (Angleterre).
- Weber**, E. K., Étudiant à l'Institut des voies de communication, rue Garnovskaia, 11, Saint-Pétersbourg (Russie).
- Weimarn**, P. P., Akadémitchski péréoulok, 1, Saint-Pétersbourg (Russie).
- Weinberg**, G. J., Ingénieur-chimiste, Nevski, 47, Saint-Pétersbourg (Russie).
- Weinberg**, S. G., Ingénieur des mines, Kirpitchny péréoulok, 1, Saint-Pétersbourg (Russie).
- Wentzel**, A. N., Ingénieur des voies de communication, Perspective Litéiny, 9, Saint-Pétersbourg (Russie).
- Werth**, O. A., rue Mokhovaia, 31, Saint-Pétersbourg (Russie).
- Wildner**, H., Vice-Consul d'Autriche, rue Sergievskiaia, 10, Saint-Pétersbourg (Russie).
- Wilén**, H., Angfartygs Aktiebolaget Bore, Abo, Finlande (Russie).
- Wilhelms**, O., Geheimer Baurat, Köslin i. Pommern (Allemagne).
- Wilson**, W., Lecturer, Canal de l'Amirauté, 9, Saint-Pétersbourg (Russie).

Windscheid, G. F., rue Faléevskaia, 7, Nikolaïev, Gouvernement de Kherson (Russie).

Winterfeld, F., Schillerstrasse,, 28, Breslau.

Winterhalter, E. E., rue Nikolaevskaia, 61, Saint-Petersbourg (Russie).

Wippert, Consul d'Autriche, rue Serguievskaia, 10, Saint-Petersbourg (Russie).

Witte, N. A., Ingénieur des voies de communication, Direction des voies de communication de Kieff (Russie).

Wohlmuth, K., Oberinspektor, Reichenberg.

Worms, St., Dr. Secrétaire au ministère du commerce, Führichgasse, 3, Wien I.

Wormser, A., rue de Mogador, 20, Paris (France).

Ybikovski, S. A., Ingénieur des voies de communication, Professeur, Tomsk (Russie).

Ydanoff, Th. N., Ingénieur, Saratov (Russie).

Yermoloff, A. S., Membre du Conseil de l'Empire, Ertéleff péréoulouk, 8, Saint-Petersbourg (Russie).

Zabelski, S. S., Ingénieur des voies de communication, rue Chamchev, 12, Saint-Petersbourg (Russie).

Zagoranski-Kissel, A. S., Capitaine de vaisseau, Kronstadt (Russie).

Zagoulaïeff, T. F., Général-Major, perspective Nikolaevski, 49, Kronstadt (Russie).

Zaïkoff, S. P., Ingénieur des voies de communication, rue Podolskaia, 11/9, Saint-Petersbourg (Russie).

Zavanella, A., Président de la bonification de terres, Mantova (Italie).

Zavaritski, B. D., Ingénieur des Mines, Moïka, 66, Saint-Petersbourg (Russie).

Zeitig, N. N., Krioukov canal 11, Saint-Petersbourg (Russie).

Zélénof, A. P., rue Galernaia, 26, Saint-Petersbourg (Russie).

Zélénof, N. A., Vice-Amiral, rue Millionnaia, 25, Saint-Petersbourg (Russie).

Ziegler von Schaffhausen, M. K., Ingénieur des voies de communication, 4^e rota, 14, Saint-Petersbourg (Russie).

- Zinine, N. N.**, Directeur de l'Institut polytechnique de Novotcherkassk (Russie)
Zméieff, J. V., Ingénieur civil, Fontanka, 78, Saint-Petersbourg (Russie).
Zouieff, A. J., Médecin d'honneur à la Cour de Sa Majesté, Grande Moskovskaia, 14, Saint-Petersbourg (Russie)
Zouieff, P. S., Constructeur, Usine Th. E. Yates, Ekaterinebourg gouvernement de Perm (Russie).
Zvérina, F., Ingénieur, Présidence du Conseil municipal de la ville de Prague.
Zviaguintseff, A. I., Ingénieur des voies de communication, rue Joukovsky, 10, Saint-Petersbourg (Russie).
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The following were prevented from attending the Congress :

- MM. HELLEPUTTE**, Ministre des Chemins de fer, Postes et Télégraphes de Belgique, Président de l'Association Internationale.
WIEGAND, General Direktor des Norddeutschen Lloyd.
VON DZIEMBOWSKI, Delegierter des Provinzialverbandes von Posen.
HERMANN, Oberbaurat zu Essen.
BASSERMANN, Staatsrat, Rechtsanwalt zu Mannheim.
KAFTAN, J., Ingénieur, Vice-Président de la première section du Congrès.
BEHRENS, Délégué du Gouvernement des Pays-Bas.
PIHLGREN, J. F. H., Représentant du Kkl. Kommerz Kollegium, Stockholm.
BERTIN, E., Ingénieur en chef, Directeur des Constructions navales en France.
CORTHELL, E., Civil Engineer.
HAMPTON MOORE, J., President of the Atlantic Deeper Waterways Association.
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DISPOSITION OF THE TIME

Sunday, 31st. May.

13 o'clock. — Opening of the delivery office at the Conservatorium.

21 o'clock. — Reception.

Monday, 1st. June.

10 o'clock. — Inauguration sitting of the Congress in the Large Hall of the Conservatorium.

14 o'clock. — Sitting of the 1st. Section in the Large Hall of the Conservatorium. Discussion of the first question. Sitting of the 2nd. Section in the Small Hall of the Conservatorium. Discussion of the first question.

Tuesday, 2nd. June.

Simultaneous excursions in accordance with the special programs :

- a) To the harbours of St. Petersburg and Kronstadt ;
- b) To the canals of the Ladoga and to Lake Ladoga.

Wednesday, 3rd. June.

9 o'clock. — Sitting of the 1st. Section in the Large Hall of the Conservatorium. Discussion of the second question. Sitting of the 2nd. Section in the Small Hall of the Conservatorium. Discussion of the second question.

14 o'clock. — Sitting of the 1st. Section in the Large Hall of the Conservatorium. Discussion of the third question. Sitting of the 2nd. Section in the Small Hall of the Conservatorium. Discussion of the third question.

16 o'clock. — Gala performance or reception.

Thursday, 4th. June.

Simultaneous excursions in accordance with the special programs :

- a) To the cataracts of Imatra ;
- b) To the cataracts of the Narva and to the works utilising the force of water.

Friday, 5th. June.

9 o'cl. — Sitting of the 1st. Section in the Large Hall of the Conservatorium. Discussion of the fourth and fifth questions. Sitting of the 2nd. Section in the Small Hall of the Conservatorium. Discussion of the fourth and fifth questions.

19 o'cl. — Diner of the Congress.

Saturday, 6th. June.

9 o'cl. — Joint Sitting of the two Sections in the Large Hall of the Conservatorium. Simultaneous discussion of Communication No. 1 of the 1st. Section and of Communication No. 3 of the 2nd. Section.

10 o'cl. — Sitting of the 1st. Section in the Large Hall of the Conservatorium. Discussion of Communications Nos. 2 and 3. Sitting of the 2nd. Section in the Small Hall of the Conservatorium. Discussion of Communications Nos. 1 and 2.

14 o'cl. — Visit to Peterhof or Tsarskoye Selo.

Sunday, 7th. June.

10 o'cl. — Conclusion of the Congress. In the evening Start, in accordance with the special programs, for the excursions :

- a) To the Volga ;
 - b) To the Baltic ports.
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PALACE OF THE CONSERVATOIRE.



Headquarters of the Congress (right wing).

MINUTES OF THE MEETINGS

MINUTES

OF THE

FIRST GENERAL MEETING

(Inaugural meeting)

Monday, June 1 (morning)

The formal opening ceremony of the XIth. International Navigation Congress took place at 10 a. m. in the large hall of the Palais du Conservatoire.

The hall brilliantly decorated for the occasion with ornamental schrubs, trophies, flags, wreaths was a magnificent sight. It held an immense crowd, estimated at over three thousand people.

In addition to prominent representatives of the navy, army and important State departments, all the members of the Diplomatic Corps were present in the boxes next to the Imperial box.

Uniforms and official dress shone brilliantly on the platform as well as in the body of the hall, whilst in the boxes around which faced the boxes of the Diplomatic Corps, could be seen the fresh and beautiful rich toilettes of the members of the ladies' Committee of the Congress, and their president Madame Schaffhausen-Schönberg-Ech-Schaufuss as well those of the wives of the leading notabilities of St. Petersburg and the wives of the members of the Congress who had come in great number to take part in the ceremony.

Punctually at ten o'clock, His Imperial Highness the Grand Duke Michael Alexandrovitch, brother of the Emperor and Honorary President of the Congress, made his official entry into the festival hall and, after receiving with great courtesy the members of the diplomatic corps and the principal delegates of each nation in rotation with whom he graciously entered into long conversations, he was escorted with great ceremony to the imperial box amidst the cheers and applause of the assembly.

His Excellency, Mr. V. E. DE TIMONOFF, President of the Local Organising Commission and of the Session, presided at the meeting, with the following gentlemen on the platform :

Mr. SCHAFFHAUSEN-SCHÖNBERG-ECK-SCHAUFUSS, Minister of Ways of Communication ;

Mr. CHIPOFF, Minister of Commerce and Industry ;

Mr. LYKOCHE, Assistant to the Minister of the Interior ;

Mr. BOSTROEM, Assistant to the Minister of Marine ;

Mr. POLÉNOFF, Assistant to the Minister of Agriculture ;

Mr. DEMKINE, Assistant to the Mayor of the City of St. Petersburg ;

Mr. DUFOURNY, General Secretary of the Permanent International Association of Navigation Congresses, representing the Executive Committee of the Association ;

FREIHERR VON COELS VON DER BRÜGGHEN, Under-Secretary of State ;

Dr. VICTOR RUSS, Mitglied des Herrenhauses ;

Mr. TROOST, Director General of Roads and Bridges ;

BARON QUINETTE DE ROCHEMONT, Inspector General of Roads and Bridges ;

Mr. L. FARAGO, Sectionzrat, Stellvertreter der K. Ung. Landeswasserbaudirektion ;

Mr. T. OKINE, Engineer of the Bureau of Public Works, Department of the Interior ;

Commander Italo MAGANZINI, President of Section of the Superior Council of Public Works.

The official delegates of foreign Governments and the Members of the Executive Committee and of the special Commissions of the Congress were also seated on the platform.

As soon as everybody had taken their places, His Excellency the Minister of Ways of Communication, made a speech in Russian of which the following is a translation : —

Ladies and Gentlemen,

In the name of our august honorary president, His Imperial Highness the Grand Duke Michael Alexandrovitch, I have the honour of welcoming the representatives of foreign Governments

as well as all the members of the XIth. International Navigation Congress who are here assembled for the first time in Russia.

It is superfluous to refer to the noble object which brings here a large number of eminent engineers and celebrities who have all taken part in the improvement of river and maritime transport.

Two-thirds of the terrestrial globe are covered with water, oceans and seas provide an unrestricted means of transport peculiarly suitable for commerce, uniting as they do continents and peoples, whilst rivers are the powerful arteries along which the trade of the world flows towards these means of communication.

You, gentlemen, are better able than others to appreciate the great importance which inland navigable waterways have upon a nation's future, for nothing contributes more towards its prosperity than an easy means of transport to commercial centres.

This question has a peculiar interest for Russia whose network of rivers, extending a length of 173,000 kilometres, forms one of its richest national assets.

The tonnage carried on these waterways actually amounts to 35,000,000 kilometre-tons.

The advantages generally afforded by water transport are still further enhanced in Russia : —

Firstly, on account of the flatness of the country, which causes a slow flow of the waters, a condition propitious to navigation.

Secondly, owing to the proximity of the sources of the large rivers which are situated in the very centre of Russia.

Thirdly, by the great expanse of our country which requires a cheap method of transport owing to the long distances.

And, fourthly, owing to the preponderance of raw material which can be transported more advantageously in bulk.

The great expanse of our country and its limited population have hitherto hampered the improvements of our rivers and the junction of their systems. But we contemplate a series of works to accomplish this object and we already have the satisfaction of pointing to the fact that a 700 ton vessel loaded at Astrachan can reach St. Petersburg in forty days by a water route of 4,000 kilometres.

This is only one of our waterways.

We have, however, many improvements yet to carry out, and we shall certainly not fail to profit by the admirable works

which have been carried out on European waterways by the labour of the people, by the skill of engineers and by the energy shown by the mercantile community.

The reports which have been submitted to the XIth. Congress on the subject of maritime and river navigation are therefore of peculiar interest to us. And we are convinced that the resolutions of the Congress will be of the greatest use for the development and improvement of maritime and river waterways.

His Majesty, my August Sovereign, has consented to accord his high patronage to the XIth. Navigation Congress. His Majesty requests me to welcome its Members to-day and to wish them success in their work.

On behalf of His Imperial Highness, our August President, I declare the Session of the XIth. International Navigation Congress to be open. (*Applause.*)

Mr. V.-E. DE TIMONOFF then spoke, as follows, on behalf of the Organising Commission :

*Your Imperial Highness,
Excellencies,
Ladies, Gentlemen,*

I am convinced that I express the views of all present in tendering in the first place the respectful homage of this Meeting to His Majesty the Emperor, who has graciously consented to act as patron of the XIth. Navigation Congress and who has kindly delegated his august brother to attend the opening of this Congress and entrusted the Minister of Ways of Communication to convey the welcome and encouragement of His Majesty.

I beg His Imperial Highness to convey to His Majesty our deep gratitude for his gracious attitude and will ask him to be good enough to send a telegram in his name to the Emperor expressing the views of this Meeting. I beg also to tender our respectful gratitude to His Imperial Highness the Grand Duke Michael Alexandrovitch for having deigned to act as First Honorary President of the XIth. International Navigation Congress and thus assured the success of our work.

You will allow me also, gentlemen, to express our gratitude to their Excellencies, the Ministers of Interior, of Finance, of

Ways of Communication, of Marine, of Commerce and Industry and of Agriculture for consenting to act as Honorary Presidents of the Congress, and to express our indebtedness to the State which has, on the initiative of the Government, granted very considerable sums as a contribution towards the major portion of the expenses of the Congress.

We beg also their Excellencies to accept our gratitude for the favourable support they gave the Organising Commission throughout the preliminary work of the Congress and also for the courtesy with which the Imperial Government, on behalf of His Majesty, invited the Foreign Governments to recognise the importance of this meeting by sending delegates to represent them officially. These invitations were invaluable, proceeding as they did from men who prior to gaining the confidence of their Sovereign which has placed them at the head of affairs in our great country, had already demonstrated in their long and honourable career that they were far from being unacquainted with the questions which are to be discussed by us.

The names of Prince Khilkoff and Privy Councillor Németchaieff, both former Ministers of Ways of Communication, must also be cited with deep gratitude for the extremely valuable support their Excellencies gave to the idea of holding the Congress in Russia, when the place of meeting was discussed, the more especially as this occurred at a time when our country was confronted with events of supreme importance which gave them little leisure to attend to other matters.

Lastly our two houses of representatives, the Duma and the Imperial Council, are entitled to our most sincere thanks not only for voting the credits which the Government had proposed for the Congress but also for voting them so willingly and for thus emphasising the importance of this meeting.

And now, gentlemen, on behalf of the Organising Commission of the XIth. Navigation Congress let me welcome you most cordially to my country. The last words in the proceedings of the Xth. Congress held in Italy in 1905 are full of promise ; they read as follows : « *The Congress members took leave of their Italian colleagues with the wish to soon meet again at the XIth. Congress.* »

Is not this keen desire to meet again, to see one another once more, a very characteristic feature of our Congresses ? Has not this working together side by side for many years for the general

welfare not welded us into one large family whose members are bound to one another by strong ties of frank and loyal affection? And when, after a separation of several years, we meet again and shake hands, does not this act express a sentiment which is something more than mere ceremony? And when unfortunately some of us are missing as are missing to-day our never-to-be forgotten friends, Conrad, Frazius, Schultz, Wittich, Merkens, Shu-Kia-Liang, Willgerodt, Ghercévanoff, Vernon-Harcourt and La Rivière, are you not moved by a deep regret which you do not endeavour to conceal, knowing how it is shared by all of us.

For my part, gentlemen, I am proud of the mission which has devolved upon me of addressing you on the opening meeting of the XIth. Navigation Congress! Be assured that it is a source of deep satisfaction to us Russians that after Brussels, Vienna, Frankfort, Manchester, Paris, The Hague, Düsseldorf, Milan, you should have desired to meet in Russia to discuss questions which have been specially chosen to deal with the most pressing requirements of our country in the domain of navigation.

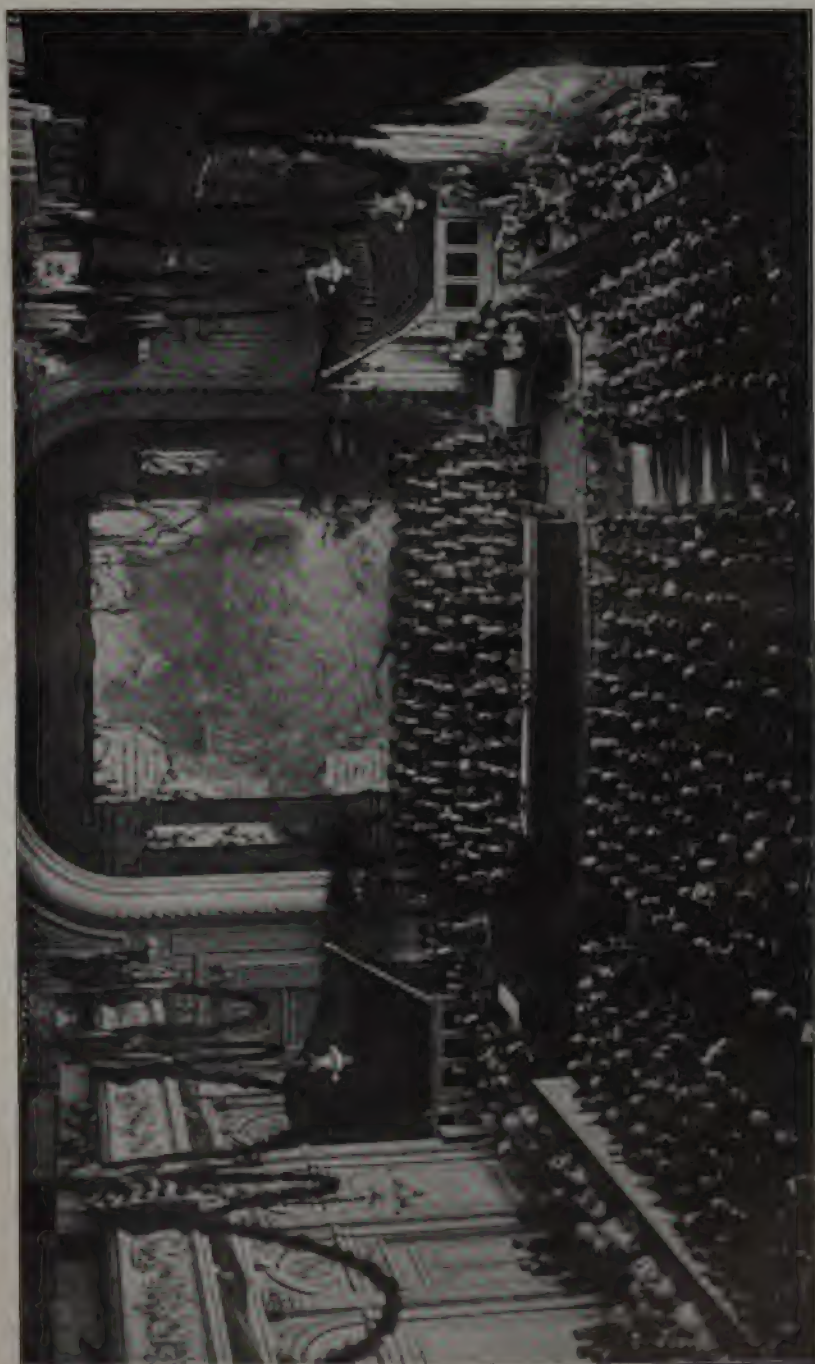
But if I am proud of the privilege of welcoming you to St. Petersburg, I am none the less greatly saddened when I think of the mysterious destiny which has willed if that our lamented First President, Mr. Ghercévanoff, who did so much in bringing about the selection of Russia as the seat of the XIth. Congress, should not enjoy the fruits of his labour and be able to tell you the joy with which he would have seen you assembled together in our capital.

Allow me, in referring to this excellent man, to place on record both our respect and our gratitude.

I hope, you will pardon this sad reference but I feel sure you would have resented its omission and you must allow your President, also stricken by fate almost on the eve of the Congress, to seek consolation in the acceptance of this great law of nature which causes beings and inanimate things to undergo continual change without ever disappearing completely.

Is not this law of transformation or evolution replete with suggestion when applied to an element which interests us so specially at this moment, namely water? Has not the water which falls upon the arid plains of Russia, been collected by solar heat from the Mediterranean, and who knows if the waters

PALACE OF THE CONSERVATOIRE. — LARGE HALL.



Opening meeting of the XIth International Navigation Congress.

of the rivers which flow along the gentle slopes of our country and fall into far-off seas, are not subsequently destined to be conveyed through the atmosphere to irrigate other regions a long way off and make them prosper.

From this point of view, navigation would only be a manifestation of the properties of water as it circulates throughout the Universe and the international character of our Congresses would thus find its physical justification.

But however rapid the evolution of matter may be, its speed is slow as compared with the flight of ideas. The works due to human intelligence, the various manifestations of man's intellectual side are universal and they leave behind them a trail of light and happiness which is not confined by the conventional demarcations between the various States. Science and its fruits are the common property of all peoples, and each session of an international Congresses affirms and confirms this truism, more and more strongly. There is not a shadow of doubt that the views which will be evolved in discussion during the present Congress, will spread to all countries in the world and will become a source of comfort and prosperity. This propagation of the products of intelligence ennobles souls and gives to each of our Congresses a high ethical importance. Inspired with this sentiment and conscious of the success which awaits you I beg you to join me in cheering the High Protector of the XIth. Navigation Congress, the Heads of all the States represented at this Congress and its first Honorary President.

Long live His Majesty the Emperor Nicholas II !

Long live all the Heads of the States which are represented at the XIth. Navigation Congress !

Long live His Imperial Highness the Grand Duke Michael Alexandrovitch ! (*Prolonged applause.*)

The Minister of Commerce and Industry makes a speech in German, of which the following is a translation : —

*Your Imperial Highness,
Ladies and Gentlemen,*

The great honour devolves upon me of welcoming the members of the XIth. International Navigation Congress in the name of the Ministry of Commerce and Industry. Let me, therefore,

express the hope that your work may be prolific in results, by solving questions which practical experience consigns to the first rank in the vast field of mercantile marine and of harbour construction. I am persuaded that the work of the Congress will facilitate the work of the Ministry confided to me which has for its object the development of navigation and harbour construction in our country.

The present Congress has a special significance for us in view of the measures which have been proposed for encouraging our navigation and our maritime trade and I may point out that this Ministry, notwithstanding its short existence, has already important work to submit to the consideration of the Congress.

The departments of the Ministry whose functions comprise the maintenance of seaports, have for a long time past been in close touch with the Navigation Congress, and our engineers have found therein much useful information.

For this reason I welcome all the more joyfully the XIth. International Navigation Congress as an event full of promise.

As an introduction, ladies and gentlemen, to the details of this branch of our national economics, I have published a work entitled « *The commercial ports of European Russia* », which deals in detail with our harbours and their developments and with their effect upon trade.

This work, as also other publications of the Ministry which give an account of the present condition of the Russian mercantile fleet and deal with naval training colleges and Government legislation, will be handed to those members of the Congress who express a desire to possess copies. This abundant information is still further supplemented by a collection of models, drawings, maps and other exhibits in the building for the purpose of contributing to the knowledge of our merchant marine and our harbour construction. The Ministry likewise intends to organise sea trips which will enable an exact idea to be formed of our harbours both as regards construction and equipment.

This alone shows the great interest which we Russians take in the questions before the Congress. We must, moreover, bear in mind that the ports of Russia have a very brief history as compared with those of western Europe. Their construction and improvement have always kept pace with the development of the means of inland communication, chiefly during the second

half of the last century and more particularly during the last twenty or thirty years.

Nevertheless even in this short space of time and especially during the last ten years a not inconsiderable amount of work has been done in this direction. New harbours have been built ; existing ports have been enlarged, deepened and brought up to date for commercial requirements. The most important of the Russian ports are those which are situated at the mouths of large rivers and although some of these, such as the ports of Archangel, St. Petersburg, Nicolaïeff, Kherson and others, are connected with the sea by means of artificial canals, the necessity of building new ports of this kind has been felt. We are also dealing with our coast navigation and fisheries which require ports of refuge and fishing harbours. Special and systematic surveys of our sea coasts are being carried out with this object. We must also build docks and slips for repairing our mercantile fleet. We must also undertake the task — and it is no light one — of repairing our harbours so as to fit them for present requirements of trade. I take this opportunity of pointing out that reinforced concrete is used to an increasing extent in the construction of Russian ports and that experiments are now being carried out with this material in quays, moles and lighthouses.

The economic aspect of mercantile navigation is of great interest to our Ministry which is endeavouring as far as possible to carry out such enquiries as may tend to promote the development of maritime trade. Of no less importance to us are such questions as those which concern the conditions governing the work of sailors, the protection of life and health, as well as those questions which concern the proper training of sailors for their difficult profession and which are fraught with great responsibility.

The Ministry would appreciate the expert views of members on these points, if not during the present Congress, at all events at future Congresses.

I am firmly convinced that a thorough investigation covering all points of view on these questions would have the most beneficial effect upon the maritime trade of the world, and would lead to a peaceful and unanimous rapprochement of the nations upon the grounds of universal work of civilisation. (*Repeated applause.*)

Mr. BOSTROEM, assistant to the Minister of Marine, then spoke in English, as follows : —

*Your Imperial Highness,
Ladies and Gentlemen,*

On behalf of the Imperial Ministry of Marine and with the greatest pleasure, I welcome the Members of the XIth. International Navigation Congress and most particularly the initiators and organisers of it, who have done so much to the benefit of this important matter.

The Ministry of Marine has shown great interest in this Congress by delegating us personally as Members of the Congress as well as by our scientific work referring to the subject of the programme.

The choosing for the site of Congress the city of St. Petersburg, due for its existence to our Emperor Peter the Great — the founder of the Russian Navy, has provoked a feeling of particular satisfaction among all Russian Mariners.

The Ministry of Marine will most heartily welcome all the Members of the Congress who will visit the Navy Clubs at Cronstadt at Port Emperor Alexander III and at Sebastopol.

The original programme of the Congress, although dealing with many important points in naval matters did not include sufficiently developed questions of security of Navigation in General and Hydrography of the seas in particular.

In conformity to the wish of His Excellency the Minister of Marine these two points are now included in the programme of the present Congress and the Ministry of Marine has undertaken the fulfillment of this addition to the programme by publishing at its own expense all the reports and articles, referring to those two points, written in the languages of all the countries participating in the Congress.

The Ministry has taken an active share in organising the National Exhibition in connection with the Congress to illustrate the development of navigation in Russia.

A special book has been published also on naval matters, which together with the Exhibition, will complete the picture of the present state of navigation in Russia. A copy of this book will be presented to each Member of Congress.

From these few words of mine you can conclude, ladies and gentlemen, how deep was the interest of the Ministry of Marine in the aims of the Congress and also that it has done all that it could.

Therefore I feel justified in expressing the hope, that the esteemed Assembly of specialists in navigation will pay enough attention to the questions of security of navigation in high seas and will duly deliberate on the fundamental questions, of such predominant significance to sailors in all the countries of the wide world through.

The enormous expanses of water that divide the continents and unite all the countries of the globe, offer a most suitable and favourable ground for the international genius to be applied for studying the seas to the mutual advantage of all the parties concerned. It is particularly desirable to trace such general aims and bases in hydrography as to justify and allow the proper using of what has already been done in all the countries, also to make scientific deductions and show the practical use of them.

I consider too to be of great importance to fix a general plan and a uniform system ; in other words standardising of those marks which whether on maps or actually on the waters, would enable any sailor of any country to follow his proper and consciously chosen safe course in any sea of the globe.

And last, but not at least, allow me to express our sincere hope that this first experiment of including in the programme of the Congress the questions dealing with navigation purely, will by the collaboration of enlightened and experienced specialists, bring such evident and useful results, that the XIth. Congress will approve a resolution that these new points ought to form in future a part of the programmes of all International Congresses to come.

I can promise you that in case some grants in aid for this purpose will be required from the Governments, the Imperial Russian Ministry of Marine will be ready to show a liberal example in this respect.

To conclude my little speech allow me to wish the Congress complete success in its interesting and useful aim and repeat in Russian fashion : « *Dobro pojalogat!* » (Welcome!) (*Prolonged applause.*)

Mr. POLÉNOFF :

*Your Imperial Highness,
Ladies, Gentlemen,*

The Minister of Agriculture being to his great regret unavoidably prevented from attending this function, I hasten on his behalf and on my own, to express our pleasure in finding that agronomical questions are included in the programme of hydrological questions.

Furthermore we take a certain national pride that this happy alliance of questions occurs at a Congress which is held under the High Patronage of our August Sovereign.

This is as it should be. A few drops of water, a few drops of rain to fructify the seed which has been sown, — and the enormous areas of oceans to convey the billions of tons of wheat and other produce of the soil, from one part of the world to another, — this is the extensive plane upon which hydrological and agronomical interests are so intimately bound together.

The nature of the climate of our country with its extensive plains and steepes which are so exposed to the dessicating effect of the wind, demands water in order to fertilise our beautiful black earth and the inexhaustible wealth of the grey earths of Turkestan and the Transcaspian regions.

Having no power to control the waters of the sky, we are compelled to utilise those of the earth and it is with this object that the irrigation works of Mourgabe and on the banks of the Syr-Daria were undertaken. A party was indeed quite recently equipped to examine the possibilities of utilising the greater portion of the waters of the Amou-Daria.

These remarks recall to me the beautiful words of the German poet regarding the great forces of nature. I crave the indulgence of the poet's compatriots if I am obliged to change one of his words : —

Wohltätig ist des Wassers Macht .
Wen sie der Mensch beginnt, bewohnt.
.
Doch furchtbar wird die Himmelskraft
Wen sie den Fesseln sich entropft.

We must, therefore, learn how to control such a salutary and such a productive force. This problem now faces us in regard to mastering the impetuous waters of the Arax. Plans have already been prepared with this object and all that now remains is to commence the actual work.

On the other hand we are on the eve of a great evolution which will change the ownership of the peasant landed property — an evolution which will tend to convert communal property into personal property. It will be necessary to provide water and fodder for the live stock of the owners of all these small holdings which are now being formed. It may not be an imposing work, but the great number of small interests which have to be conciliated are quite sufficient to attract special attention to the problem.

This survey, however brief, would be incomplete without a reference to the hydrotechnical work which has been carried out at the Government's expense on the marsh lands of the Upper Dnieper and its tributaries. The problem was to canalise and drain this immense region which had hitherto been almost inaccessible.

It was traversed in different directions by quite a network of canals representing a total mileage of 5,000 kilometres. Consequently as a kilometre of canal is able to drain more than a square kilometre of land, the total area of land thus rendered fit for cultivation exceeds over half a million hectares.

In addition to this great work, other drainage works were carried out in the northern and north-western regions and in Siberia to the extent of 4,000 kilometres of canal which brings over 400,000 hectares of land under cultivation.

I think, gentlemen, that I was justified in saying that the alliance of hydrological and agronomical problems was a happy augury. It only remains for me to express the hope that these questions may be brought more and more closely together to their mutual advantage. It is in this spirit, gentlemen, that I welcome you, with the assurance that the work of this Congress will be of the utmost benefit in view of the eminent members who belong to it. (*Prolonged applause.*)

Mr. LYKCHINE, assistant to the Minister of the Interior, then spoke in Russian, of which the following is a translation : —

*Your Imperial Highness,
Ladies and Gentlemen,*

The Ministry of the Interior has no direct interest in the objects and problems which are inscribed on the agenda of the Congress, but the realisation of these problems will no doubt increase the welfare of the Russian people. The extension of our inland navigable waterways will above all be of great importance to a large number of Russian peasants who depend for their living upon work connected with navigable waterways. The Ministry of the Interior will, therefore, follow the work of the Congress with the greatest interest and the Minister of the Interior has asked me to welcome all the members of the Congress and to wish them not only all possible success in their work, but also an agreeable sojourn in Russia. Be assured, gentlemen, that you will be received everywhere with traditional Russian hospitality and that the representative, of the Government will help you as much as they possibly can. Once again, gentlemen, I welcome you and wish you every success in your work. (*Applause.*)

Mr. DEMKINE, assistant to the Mayor of St. Petersburg then spoke in Russian, of which the following is a translation : —

*Your Imperial Highness,
Ladies and Gentlemen,*

It is with great pleasure that I acquit myself of the duty which has been laid upon me of welcoming you on behalf of the city of St. Petersburg and at the same time of thanking the Permanent International Commission of Navigation Congresses quite specially for having accepted the proposal of the Russian Government to hold the present Congress in St. Petersburg.

The work of Navigation Congresses, namely the elucidation of all inland and maritime navigation questions, is congenial to us Russians and is in our opinion most important.

Russia is interested in these questions not only in its capacity of member of a large international family, but also as a national and political entity.

From an international point of view, our country cannot ignore the idea of bringing the nations together by friendly relations.

This idea is realised by the Association by means of its periodical Congresses which endeavour to ascertain the best and least costly means of utilising the natural ways of communication.

Within the narrower scope of national interests, our country, which possesses the greatest rivers of both hemispheres, rightly attaches special importance to the work of Navigation Congresses.

We have hitherto not taken sufficient advantage of the advantages accruing from our inland navigable waterways, partly on account of unfavourable geographical conditions which are not insurmountable and partly owing to uncertainty as to the best means of improving our navigable waterways.

The results of the work of Navigation Congresses will without a doubt remove the obstacles which I have just referred to as impeding the development of these waterways.

Although it does not possess a coast line in proportion to its vast area and has no suitable outlet on the sea, Russia is notwithstanding very much bound up with commercial and maritime navigation interests.

Therefore, gentlemen, you will find in Russia a number of difficult and complex questions bearing upon navigation, which will deserve your enlightened consideration. I need only mention the waterway to connect the Baltic with the Black Sea, the Siberian railway via the Arctic Ocean, and the incessant struggle against the silting up of our rivers.

As to the city, gentlemen, which you have honoured with your presence, you will remember that it is connected with the immense basin of the Volga by a network of canals. Situated at the mouth of the powerful Neva on the Baltic Sea, it is the commercial link which connects eastern and western Europe.

The city of St. Petersburg and Russian maritime navigation are twins. Both owe their existence to the reformer who had ever present in his mind the motto « *Navigare necesse* » which has been adopted by the International Association.

The prosperity of the Russian capital is indissolubly bound up with that of Russian maritime navigation. Latterly we have made great progress in this direction. We may mention that the sea approaches to St. Petersburg have been deepened from 9 to 22 feet during the last twenty-five years and, according to the Minister of Commerce, this depth will be still further increased to 28 feet during the current year.

It is only ten years ago that the Municipality of this city was called upon to play a more important role in the port improvements. Much work remains to be done in this direction and before all a general plan must be drawn up of the works that have to be carried out. The necessity of such a plan was recognised as far back as 1900 by the Municipal Council.

Let us hope that the work of the Navigation Congress will give a fresh impetus to the solution of this problem and will bring additional information which may assist in its final elucidation.

From another point of view the work of the Congress has also a very special interest for our city. For a long time past the city has battled against the encroachments of the sea which, to quote our national poet, cannot forego the hate engendered by its captivity of former years.

The city has just expended about a million roubles for public works which are intended to raise the level of the ground most exposed to floods. But the enemy is far from being conquered. The inhabitants of St. Petersburg will, therefore, learn with satisfaction that among the papers to be discussed by the Congress is one which deals with the protection of low-lying lands against floods.

Members of the XIth. International Navigation Congress, the Russian Society in conjunction with its Government will follow your debates with the utmost interest. For my part, as representative of the city of St. Petersburg, it is my pleasant duty to welcome you most cordially in its name. (*Repeated applause.*)

Mr. DUFOURNY, General Secretary of the Permanent International Association of Navigation Congresses, then spoke in French, of which the following is a translation : —

*Your Imperial Highness,
Excellency,
Ladies, Gentlemen,*

Mr. Helleputte, president of the Permanent International Association of Navigation Congresses, Minister of Railways, Posts and Telegraphs, and Minister of Agriculture in Belgium had always intended for many months past to come and preside over the XIth. International Congress at St. Petersburg. Only a few days ago, he assured me that this would be so. But I have just been advised that unforeseen circumstances have arisen at the last moment which compel him to remain in Brussels to his great regret.

His great talent and reputation, his eloquence were needed to speak at this solemn moment before this illustrious assembly which has been honoured by the presence of His Imperial Highness the Grand Duke Alexandrovitch, Honorary President of the Congress, their Excellencies the Ministers of the Emperor of Russia, the Ministers of Ways of Communication, Finance, Interior, Commerce and Industry, Marine and Agriculture, before the Representative of the Mayor of St. Petersburg and before the officially accredited representatives of nearly all the nations.

The General Secretary of the Association who unfortunately does not possess the eminent qualities of its President, and who is moreover taken unawares, is face to face with the onerous and perilous task of making a speech in the name of the whole Association. He claims the indulgence of the meeting.

His first thought and his first words go, as they should do, to His Majesty the Emperor Nicholas who has deigned to honour our Association by according his High Patronage to the Congress, who has invited the collaboration to this Congress of all the Governments of the old and new worlds and who has appointed so brilliantly, His Imperial Highness the Grand Duke Michael Alexandrovitch and his Ministers to represent him at the opening of the meeting which we are celebrating to-day.

At the word of the Tzar of all the Russias, a vast concourse

has assembled from all parts of the globe ; a pacific and glorious army of illustrious engineers, of eminent scientists, of distinguished hydraulic experts, of competent hydrographers, of experienced navigators, all burning with the desire of contributing by means of their investigations, their knowledge and experience towards the welfare, greatness and industrial and agricultural development of this vast Empire of Russia which alone comprises an area of over 20 million square kilometres, that is to say an area twice as large as Europe and about half that of Asia.

An intense current of peace, good will and brotherhood animates the whole world at present, leaving progress, civilisation and general welfare in its train.

The International Association of Navigation is busily engaged in increasing the intensity of this current by carrying out its great work of gathering together hydraulic knowledge from all sources. This work is open to all willing men, both great and little, and with such absence of favouritism that you find the representative of one of the smallest States in Europe, entrusted with the honour of expressing the profound respect and gratitude of this Association to one of the most powerful sovereigns of the world, the Emperor of Russia.

We also beg his Imperial Highness, their Excellencies the Ministers and the Assistant of the Mayor of St. Petersburg, who have welcomed us so warmly and so eloquently and who have expressed such sincere wishes for the success of our work, to be assured of our deep obligation towards them and desire of showing them our complete and absolute devotion on all occasions.

The President of the Organising Commission, our eminent colleague Mr. de Timonoff, is also entitled to our praise, congratulations and gratitude. He has assumed the heavy and double burden of Presiding over the Commission and of being at the same time its General Secretary.

It is our duty to declare loudly that the organisation and preparatory work of the XIth. Congress have been perfect, and that, whether considered as a whole or in detail, it has been a wonder to all those who, from their experience, know the enormous difficulties of the problem which in this instance have been so ably overcome.

Our praise is also due to the workers, to those scientists who by great labour and remarkable knowledge, have built up the

immense edifice of science and experience which is represented by the numerous reports which have been submitted to the St. Petersburg Congress.

The scope of this Congress is more extended than that of any previous one. Not only does it comprise navigation questions, but it also includes all those questions which touch upon the use of water for industrial and agricultural requirements and those which concern the security of maritime navigation. And this is as it should be in a country whose wealth lies in the best use which can be made of its waters, a country whose system of waterways is the most extensive in the world with its 173,000 kilometres of rivers, lakes and canals which exceeds by 51,000 kilometres the combined mileage of the waterways of the United States, Germany, France, Great Britain, the Netherlands, Sweden, Austria, Hungary and Italy. These waterways are apportioned as follows in the above countries :

United States	33,688 kilometres
Germany	24,159
France	21,561
Great Britain	13,087
Netherlands	8,087
Sweden.	7,211
Austria	6,461
Hungary	4,971
Italy	3,550

The Congress which is about to open has a very heavy task before it. Its object and scope will be to train river courses, to adapt dams to navigation requirements, to ascertain the cheapest methods of working navigable waterways and of hauling boats upon them.

We shall deal with the plant of inland harbours and with the construction of canals which shall comply with the requirements of both navigation and agriculture.

We shall also deal with fishing ports, maritime ports, harbours on sandy soils, and with the conditions of maritime security and the hydrographical survey of seas.

Through me, the Association expresses the most sincere wishes that the work of this Congress may result in a great benefit to the Russian Empire.

We hope that vast Empire will improve its system of waterways, its harbours and its navigation ; that its commerce, industry and agriculture may take a renewed lease of life thanks to the suitable conditions of its water supply and the low cost of transport, and that the public wealth may increase as much as possible and confer a welfare upon the whole nation.

This is our most sincere and fervent wish. Convinced that our heart is in unison with that of the whole Association and that I am the trustworthy spokesman of its members, I exclaim in the name of the Association : —

« Long live the Emperor, the August Defender of all the works of Peace ;

» Long live the Emperor, the far sighted initiator of International and Universal Congresses ;

» Long live the Emperor, the high, mighty and very enlightened Protector of Navigation ;

» Long live His Imperial Highness, long live the Grand Duke Michel Alexandrovitch, Honorary President of the XIth. Congress ;

» Long live Russia which has been one of the most solid and unswerving supporters of our Association since its very foundation ;

» Long live Russia ! Long live St. Petersburg ! »
(*Prolonged applause.*)

FREIHERR VON COELS VON DER BRÜGGHEN then spoke in German of which the following is a translation : —

*Your Imperial Highness,
Very honoured Ladies and Gentlemen,*

Allow me in the first place to express our deep gratitude to His Majesty the Emperor, the High Protector of the Congress, for having ratified the invitation which we all accepted so willingly. Then let me express our gratitude to Your Imperial Highness for the honour you have conferred by attending the opening meeting to-day, and lastly let me render our thanks to the Imperial Government and also to the Council of the Congress who have borne the brunt of the preparatory work.

The great Russian Empire with its inexhaustible resources, its lakes and its extensive canals, its ports on all the seas which surround it, confronts the engineer with immense problems. If the knowledge of what is now being done here and a brief survey of what will be accomplished in the future, is combined with the regular work of the Congress, the result will be an immense gain to science and to all those who have been able to come here, and they will reap its benefit throughout their lives.

In accordance with the tradition of previous Congresses I have to give you a short account of the hydraulic works which have been carried out since the last session in Germany and in several other countries whose representatives gave me information on the point yesterday.

A good deal of work has been carried out in the *Netherlands*, the ancient home of hydraulic construction, whose arduous struggle against the waters bred engineers long before all other countries.

Amongst maritime works, we must cite before all the nearly completed canal from Amsterdam to the North Sea which has 8 metres navigable depth and is of great width with large bridges and electric light so that the largest vessels have easy access to this old commercial city. The construction of locks of larger size than any hitherto built, is also worthy of note.

The sea route towards Rotterdam is constantly being improved to cope with the continual increase of traffic; the city is about to build a new port — that of Waal — which will cover 340 hectares and will be one of the largest in the world.

Improvements in inland navigation are also contemplated by building a canal in southern Brabant.

Sweden is now completing works for utilising the water power of Trollhättan; she has acquired the falls of Gotälf which will give her approximatively 200,000 H. P. Thus she contributes her share in opening the way to a solution of this important question of our times, namely to ascertain whether industries shall continue to be carried on in the vicinity of coal deposits or whether hydraulic power may not be employed as an effective substitute for coal. In connection with some of the work already commenced it is proposed to rebuild the celebrated old canal of Trollhättan. All these works will

be carried out under the auspices of a Royal Commission which is now being appointed.

Hungary, more than any other country, has known how to adapt its hydraulic works to the requirements of rural economics which in that country are in a very up to date condition. She continues her work in that direction; and the work by which 37,000 square kilometres of land have subsequently been protected by dykes against floods, is no less worthy of our admiration than that given to the work on the Iron Gates of the Danube. At this very moment a bill drafted by the Minister of Agriculture is now being considered by Parliament, its object being to ensure the means of continuing the training of rivers and the canalisation of tributaries over a total length of nearly 1,000 kilometres.

Germany has undertaken the task of assisting the development of maritime traffic and of inland navigation by important engineering works. The Hanseatic cities of Hamburg, Bremen and Lubeck have increased their port accommodation at great cost, taking particular care to increase the depth of the channels which lead to the sea. When the proposed works are completed this depth will attain 10 metres at low water for Bremerhaven and Hamburg. Important works have been carried out to increase the urban port of Hamburg and the national harbour at Emden. The Kaiser-Wilhelm Canal which is used for maritime navigation, will be rendered accessible to the largest sea vessels at a cost of 223 million marks. The lighting of the coasts has extraordinarily improved, partly by increasing the number of lights, but especially by increasing their intensity which has been achieved by means of new inventions and chiefly by means of electricity.

When the law on Prussian canals was voted in 1905, after much opposition in Parliament, and after the negotiations with the interested parties covering the necessary compensations prescribed by law, had been successfully carried out, there remained a surplus of nearly half a milliard for the amelioration of navigation and for the improvement of agricultural cultivation. Meanwhile it had been possible to go into the details of nearly all the schemes. The earthworks along the Berlin-Stettin waterway are already commenced. Construction is about to be commenced along the Rhine-Hanover canal. The preliminary work of the great storage reservoirs in the

Weser basin is in such an advanced state that it has been possible to compute the exact size of these reservoirs. The capacity of these will be 200 million cubic metres as regards the Oder and 20 million cubic metres as regards the Diemel.

The works on the lower Oder and on part of the middle Oder are approaching completion whilst on the upper Oder twelve new locks for trains of barges have been constructed in addition to the single locks. Work has been commenced on the Warthe and on the Netze which will render these waterways accessible to 450 ton vessels. A special act has been passed sanctioning the construction of the navigable canal which will connect the town of Königsberg with the Masurenland lakes. The work of considerably increasing the size of the port of Ruhrort on the Rhine, which is the largest inland port on the continent and perhaps in the whole world, will soon be completed. We owe the completion of the Teltow canal to municipal enterprise, an interesting feature of this work being the train of electric barges which we had the pleasure of showing to numerous members of the Congress on their way through Berlin.

Hydraulic works are also being carried out to an increasing extent in South Germany. Without counting the interesting and ambitious schemes which have not yet received official sanction, we may mention that in Baden, in Alsace-Lorraine and in Bavaria, steps are being taken to render the portion of the Rhine between Mannheim and Strasburg navigable for large vessels, and that an agreement has been made between the states contiguous to the Meise to extend the canalisation of this river from Offenbach to Aschaffenburg. This agreement will be carried out as soon as the question of regulating the tolls of navigation in natural waterways has been settled. The Prussian Government hopes to settle this question and those who have opposed this taxation most energetically will be converted when they recognised more clearly and more generally that the Government does not propose this measure with a fiscal object or with any intention of changing economic conditions, but solely with the object of raising funds which it could not otherwise raise for improving our natural waterways.

The total traffic on inland waterways in Germany amounted in 1905 to about 15 milliard ton-kilometres and since then these figures have considerably increased.

The considerable works carried out in the above mentioned

States have frequently necessitated changes of staff amongst the higher officials of the Administration and an increase in the number of employees. Furthermore the work itself requires the reinforcement of intellectual equipment. For this reason we have come here with a special purpose, desiring to instruct ourselves as much as possible and to contribute our share in helping the Xth. Navigation Congress to achieve its good work by active and friendly interchange of ideas, of forwarding the interests of commerce and navigation and increasing the welfare of all the peoples by peaceful means. (*Prolonged applause.*)

Mr. SANFORD then spoke as follows in English : —

It is a special and accidental honour for me to represent, in the capital of this great and wonderful country, so much of the world as is included in the countries whose people speak the English language ; and it is only very recently that I learned that I must have this honour and responsibility.

Speaking particularly with regard to the United States and Canada, though with some reference also to the other lands dependent on Great Britain and the United States, I would call attention to the fact, known to you all, that we have an enormous country, reaching from the frozen Polar Ocean to the tropical and semi-tropical lands of the south, a country very similar — almost the same — to Russia. Hence the great questions regarding inland and maritime navigation which interest the people of Russia are, to a very large extent, duplicated with us.

In respect of natural conditions then we find here a country that strongly reminds us of our own countries. In other respects also we are made to feel that we are not in a strange land. Of course, from America the journey to St. Petersburg is very long, and from England it is rather long also ; but, when we arrive, we find a splendid, magnificent welcome, due to the great and well directed efforts of your President, Mr. de Timonoff, and of those who have assisted him in arranging for our comfort and pleasure.

I desire to express the thanks of all the English speaking representatives and members for this beautiful welcome, and to repeat that we have been obliged to feel ourselves entirely at home here. (*Applause.*)

BARON QUINETTE DE ROCHEMONT then spoke in French, of which the following is a translation : —

*Your Imperial Highness,
Ladies, Gentlemen,*

Called upon to speak on behalf of the Government Delegates of those countries which generally adopt the French language for the reports submitted to our Congresses, may I in the first place address in their name our respect and deep gratitude to His Majesty Nicholas II for the honour he has done us in according his High Patronage to the XIth. Navigation Congress. The Emperor by this token of goodwill, again shows the interest he takes in our work and in the development of international relations which tend to bring the various countries more closely together.

His Imperial Highness will, I trust, allow me to express how grateful we are to him honouring this meeting with his presence and thus showing an interest in our work which touches so closely upon subjects which occupy his thoughts and his care.

In accordance with our traditions, I will give a brief account of the navigation works which are being executed in those countries for which I am the spokesman.

In France, when only about 170,000,000 francs remained to be expended to complete the Freycinet programme of works, various decrees and laws, of which the most important is that of December 22, 1903, were passed allocating in all the sum of 302,374,000 francs. Of this amount 174,469,000 francs were destined for the improvement of inland navigation and 127,905,000 francs were destined for the development of seaports.

The expenses incurred from January 1. 1903 to December 31. 1907 amounted to 165,030,000 francs of which 59,045,000 francs were for inland navigation and 105,985,000 francs for seaports.

The navigable waterways which connect Paris with the North of France and with Belgium, have been improved. The canal from the Marne to the Saône has been completed and the works of the new canals of the North and of the Rhone to Marseille and Cette are either commenced or on the point of commencement.

The improvement of the Seine, the Loire and the maritime portion of the Garonne is being carried out.

New entrances have been provided for the ports of Havre and Saint-Nazaire, and one will shortly be provided for Dieppe. The plant and equipment of Dunkirk, Boulogne, Dieppe, Havre, Rouen, St. Nazaire, Nantes and Bordeaux are being extended. The Pinède basin at Marseille has recently been opened to traffic.

But these works are inadequate for the requirements of navigation. Thus on April 2. last, Mr. Barthou, the Minister of Public Works, approved a scheme which covered the whole network of inland navigable waterways and dealt with the necessary administrative and financial provisions for carrying out work of recognised utility.

On the other hand the Government continues its enquiry on the improvement of seaports at an expenditure of 155,000,000 francs. New basins would be built at Havre (86,000,000 francs) and at Marseille (32,000,000 francs) and the dykes along the Seine would be prolonged (12,000,000 francs). Some of these schemes are actually before Parliament.

In the French colonies, the ports of Algiers, Oran, Bône, Tunis and Dakar are being enlarged and a large dock is being built at Diego-Suarez.

In Belgium, the Government is carrying out an extensive programme of works. For this purpose the sums of 26,125,044 francs and 27,194,251 francs have been appropriated for inland navigation and for the improvement of seaports for the years 1907 and 1908 respectively. The port expenditure contributed by the cities is not included in the latter sum. Antwerp, in particular, appropriated a sum of over 16,000,000 francs for the years 1906, 1907 and 1908 for the construction of two basins and one lock. The principal works of inland navigation now being built are the completion of the canal from Mons to Condé, the enlargement of the cross section of the canal from Charleroi to Brussels, and the improvement of navigation and of flood waters of the Meuse, the Upper Scheldt, the Lys and the Rupel and also the line from Liège to Antwerp. The maritime canals of Ghent, Brussels and Bruges are in course of completion.

The ports of Ostend, Zeebrugge, Bruges and Ghent were opened in July 1907 by King Leopold II. It has recently been

decided to build a large dry dock and two new basins at Antwerp. In addition to this the attention is being paid to the improvement of the port entrance by training the course of the Scheldt.

In Italy, attention has been specially paid during the last few years to the improvement of navigable waterways. Two commissions appointed to require into the measures to be taken for developing inland navigation, have decided to carry out a series of works which are estimated to cost 500,000,000 francs. A law will be submitted to Parliament to obtain the necessary powers to carry out a considerable portion of this programme

As regards the seaports, the act of March 13, 1904 appropriated a sum of 32,000,000 francs for the construction and equipment of quays in the ports of Savona, Leghorn, Naples, Messina, Ancona, for dredging the port of Brindisi and for completing the jetties of the port of the Lido at Venice. Another act, of July 8 in the same year, appropriated a sum of 12,500,000 francs for building a new basin at Naples. About this time the Consortium at Genoa decided to expend 15,000,000 francs for enlarging the port. All these works are being actively carried out.

Finally a law of July 14, 1907, sanctioned the carrying out of a series of works estimated at 137,043,000 francs which comprised chiefly the extension of the protection moles, the construction of quays at Naples (11,000,000 francs), Leghorn (10 million francs), Palermo (7,600,000 francs), Savona (7,000,000 francs), and Civita Vecchia (6,000,000 francs), and the construction of jetties to the port of Chioggia and of quays at Venice (15,500,000 francs).

No attention appears to be paid to inland navigation in Spain, Portugal and South-America, but a large number of seaports are being improved.

Only the works of the port of refuge of Musel are being carried out directly by the Spanish Government and 16,833,900 pesetas are being spent by it for the construction of protection moles and quays.

The other seaports are generally controlled by works commissions which are known as « Juntas de Obras » which carry out works as these are required within the limits of their means. Amongst the most important works now being carried out, are the extension of the jetties and the construction of quays at

Barcelona (37,000,000 pesetas), Valencia (13,715,295 pesetas), Cadiz (9,780,775 pesetas), the widening of the Nervion and the equipment of the outer harbour of Bilbao (7,186,139 pesetas), the improvement of the Guadalquivir which leads to Seville and the construction of a large dry dock at Santander (4,800,00 pesetas).

In Portugal, work has hitherto been restricted to the equipment of the port of Lisbon and the strengthening of the dykes of Leixoes. But comparatively important works are being carried out in the Portuguese colonies, as for instance at Lorenzo-Marques and Beira (East Africa) and at Mormugão (Hindustan) at the rail heads of the various railways which go up country.

Most of the ports of South America which had remained in primitive condition until recently are now in process of conversion.

In Brazil, the ports of Manaos and Santos have been recently opened to traffic. The works of Bahia and Rio Janeiro are being actively pursued. Those of Para, Pernambuco and Rio Grande do Sul are begun or about to be begun. In these various ports, the basins are in direct communication with the sea.

The same applies to the port in course of construction at Montevideo (Uruguay).

Tidal basins have been built at Buenos-Aires and at Bahia Blanca in the Argentine Republic. The port of La Plata is in course of completion as also that of Rosario which is situated on the Parana, 300 kilometres above Buenos-Aires. But here, as at Montevideo, the available draught at low water is generally between 6.50 m. and 7.50 m. whereas in the Brazilian ports it more often attains 9 metres.

In conclusion, and speaking on behalf of the delegates of Foreign Governments and those members of the Congress whom I represent, I address my sincere congratulations to the Organising Commission for the brilliant manner in which it has prepared the XIth. Congress, and I thank the previous speakers warmly for their kind words of welcome.

We cannot show our gratitude more thoroughly than by concentrating all our efforts in studying and solving, if possible, the various questions before us which affect Russia in particular. I offer you this co-operation with all my heart in the name of the Latin countries, with the assurance that you can absolutely rely upon it.

Before I leave the platform, at the moment when our meeting is about close, let me ask you once more to shout : « *Long live the Emperor Nicholas II ! Long live His Imperial Highness the Grand Duke Michael Alexandrovitch. (Prolonged applause).*

Count ERIC DE KIELMANSEGG, Governor of Lower Austria, then spoke as follows : —

*Your Imperial Highness,
Excellencies,
Ladies and Gentlemen,*

I have the honour of saluting the illustrious assembly of the Navigation Congress in the name of the Austrian delegates who are here, and of expressing our gratitude to the Imperial Russian Government as also to the President of the Congress and the Members of the Local Commission, for the charming welcome we have found in your beautiful capital.

We are more and more convinced in Austria of the extreme importance not only of navigation — our ancestors were well aware of this — but especially of the fact that it is the duty of the Government and of the various parliamentary representatives, to do all they can to facilitate the improvement of all waterways which can be used for navigation by means of all the modern appliances with which the development of hydro-technical science has furnished us within recent years.

Allow me to place before you, in a few words, a short account of what we have accomplished in this direction since our last Congress, and also tell you what we contemplate doing and what we have commenced.

The Danube, our principal river, has been so regulated for a long time past, as you know, upon mean water level that it has become quite accessible to ships of even large tonnage. Nevertheless we have commenced and almost completed the important work of regulating this very river under the low water regime so as to comply with the exigences of navigation and allow commercial navigation to be carried on without interruption.

We have also built a large winter and commercial port quite close to Vienna and we have established communication be-

tween the port of Linz, which is the capital of Upper Austria, and the railway.

The canalised Danube which traverses Vienna, has been converted into a kind of port by means of two large dams with locks, and is thus protected against floods and ice.

In Bohemia, in order to render Prague accessible to large vessels, we have canalised the Moldava up to Melnik, deepened the port of Holleschowitz near to the capital of this kingdom, built another port for lumber traffic in particular at Smichow, one of the suburbs of Prague, and commenced the canalisation of the Elbe in the stretch from Melnik to Aussig. This very river is already trained from that point to the frontier of the kingdom of Saxony.

We were very lucky last year to receive the visit of the high hydro-technical officials of the Imperial Russian Government, and thanks to their aimiable foresight the fairly important training works of the Vistula on the Russian frontier up to Cracow are now in course of execution.

Our law of 1901, which deals with waterways, has been effective in solving many questions of communication in general and especially those of navigation by bringing about various fresh training works for rivers and waterways. For instance the training of the March in Moravia has been commenced and it will be complemented in Lower Austria by the training of the « Thaya ».

Plans are almost completed for building a large navigable canal which shall connect the Danube with the Oder and with the Vistula.

Ladies and gentlemen, I trust these few remarks have shown you that the hydro-technical services are in a very advanced state of development in our country and I may add that it is thanks to the monies voted by our Parliament that the great improvement works of the seaports of Trieste and of Dalmatia are in a fair way of progress. We have just organised along a few waterways a service for giving warning of the rise of the waters by means of teleautographs. This enables navigation to be always well posted up in all quarters so that the inhabitants of towns and villages which are situated near these waterways, may take the necessary steps in time to protect themselves against a great rise in the water and floods.

Allow me, ladies and gentlemen, to thank you for having been good enough to listen to me and also to tell you how proud the Austrian delegates and I are to be privileged to take part in this celebrated meeting, under the auspices and high patronage of His Majesty the Emperor, and in the very presence of an august member of the Imperial Family, which is held in St. Petersburg, your magnificent capital which was founded by the Emperor Peter the Great, the most renowned expert in all those subjects which are now being dealt with by this Congress. (*Renewed applause.*)

Twelve o'clock has struck. President de Timonoff declares the meeting at an end. The important personages of the assembly move forward to present their respects to the Honorary President, the Grand Duke Michael, who leaves the hall amidst much enthusiasm and prolonged applause.

The immense crowd in the hall, gradually becomes smaller and smaller and everyone present is busy welcoming friends and acquaintances, the Russian members being particularly gracious towards their foreign guests.



II. I. H. the Grand Duke MICHAEL ALEXANDROVITCH leaving the opening meeting of the Congress.

MINUTES
OF THE
MEETINGS OF THE SECTIONS

FIRST SECTION

(Inland Navigation)

OFFICERS OF THE SECTION

PRESIDENTS :

Messrs. E. F. Hoerschelman, Councillor of State, Chief of the Administration of Lines of Communication of the District of Warsaw, Warsaw ;
Lieutenant General J. S. Jilinski, Director of Agricultural Hydraulics.

VICE-PRESIDENTS :

Austria :

Messrs. Kautzky, Chief of the Department of Inland Navigation in the Imperial and Royal Ministry of Commerce.

France :

P. Mallet, Engineer of Arts and Manufactures, Member of the Chamber of Commerce of Paris.

Germany :

von Doemming, Ministerial Director and Senior Director of Construction in the Royal Prussian Ministry of Public Works ;

Dr. Krause, Privy Councillor of Justice, Second Vice-President of the Prussian House of Deputies, First President of the Central Society for the Improvement of the River and Canal Navigation of Germany.

Holland :

A. Deking-Dura, former Chief Engineer of the Waterstaat, The Hague.

Hungary :

J. von Udransky, Technical Councillor.

Italy :

Albert Torri, Senior Inspector of Civil Engineering at Rome.

Japan :

Dr. Tadao Okino, Engineer, Bureau of Public Works, Department of the Interior.

SECRETARY IN CHIEF :

Mr. H. C. Merczyng, Councillor of State; Engineer of Lines of Communication, Professor at the Institute of Engineers of Lines of Communication.

ASSISTANT SECRETARY IN CHIEF :

Mr. W. H. Czarnowsky, Councillor of State, Engineer of Lines of Communication.

SECRETARIES :

Austria :

Messrs. Paul Schrekenthal, Ministerial Vice-Secretary.

France :

Naudé, Chief Engineer of the Ponts et Chaussées.

Germany :

Ragoczy, Secretary General of the Central Society for the Improvement of the River and Canal Navigation in Germany.

Hungary :

J. Maurer, Engineer.

Italy :

C. Valentini, Chief Engineer of Civil Engineering.

Japan :

Dr. Ayafiko Ishibashi, Engineer of the Lighthouse Bureau, Department of Communications.

Russia :

F. V. Dorliac, Councillor of State ;
N. M. Ghercevanoff, Engineer of Lines of Communication ;
A. A. Telaguine, Civil Engineer ;
N. P. Pousyrevski, Engineer of Lines of Communication ;
A. M. Roundo, Engineer of Lines of Communication ;
V. E. Scholz, Secretary of the Direction of Agricultural Hydraulics ;
C. C. von Schwanebach, Councillor of State ;
M. A. Szystowski, Engineer of Lines of Communication ;
A. S. Tannenbaum, Engineer of Lines of Communication.

FIRST SECTION

(Inland Navigation)

FIRST SESSION

Monday, June 1, 1908 (afternoon)

Mr. DE HOERSCHELMANN, presiding.

The meeting was called to order at 2 P. M., in the large hall of the Conservatory of Music.

The President announces at the opening of the session that Mr. Kautzky, Chief of the Department of Inland Navigation in the Imperial and Royal Ministry of Commerce and Head of the Administrative Division of the Direction for the Construction of Waterways, at Vienna, has been appointed to replace Mr. Kaffan, Engineer, as Vice-President of the First Section.

He then delivers the following address : —

Gentlemen and Members of the First Section of the XIth. International Congress of Navigation, please accept my best wishes of welcome among us. It is with a feeling of the highest satisfaction that my fellow countrymen and I note the large number of our honored colleagues from abroad who have so kindly consented to undergo the fatigue of a long journey to be present at our Congress. Our feelings of gratitude are all the more lively because there are, among the questions which we have to consider, several about which we are sure to receive from them abundant and highly useful information. So far as I am concerned personally, I desire to be allowed to add to this the expression of lively pleasure which I feel in seeing at the

Congress so many greatly esteemed colleagues with whom I have had, for a long time, the marked honor of entertaining relations of good fellowship.

The programme of the First Section contains five questions and three communications. As compared with former Congresses, the present one has completed the part of its programme relating to inland navigation with questions concerning the regimen of water in its relations to agriculture. The result of this is a great increase of subjects to be discussed by our section.

The first of the questions on the programme of the First Section is that of the arrangements to be given to dams in rivers having great variations of discharge and even carrying large quantities of ice, so as to subserve the interests of navigation and industry.

There are no great changes of level in the greater part of our country. There are fewer streams coming with a great slope from high mountains than are found in several other countries. Nevertheless, there are in Russia cataracts on rivers which have plenty of water (Dnieper, Volkhoff, Angara and others), which are a large source of living forces and of which the fall is worth utilizing to the advantage of industry.

In order that this may be done with a judicious care for the interests of navigation and industry, it is necessary to have the opinions of learned hydraulic engineers from other countries where such a utilization of streams has been greatly developed.

With lively interest is also awaited the discussion of the second question : the economical, technical and administrative study of operating, and of the mechanical traction of boats on rivers, canals and lakes, as well as the monopoly of traction.

This question is one of great interest for the artificial lines of navigation converging on St. Petersburg and connecting the capital with the immensely extensive basin of our greatest river, the Volga.

With the constantly increasing development of our railway system, the third question, on the equipment of ports of inland navigation, becomes one of constantly increasing importance for our economical and industrial life.

Statistical data show that our river ways carry nearly as much freight of all sorts as do the railways, which are suffering more and more from an overload of traffic which our

water highways are called on to lighten, at least so far as bulky freight is concerned. Hence it is of the utmost importance that the reciprocal relations of the railway and navigable systems should be as close as possible, a condition which can only be brought about by a suitable equipment of the ports of inland navigation.

Questions 4 and 5 which treat of mixed canals which can subserve the interests of navigation and agriculture at the same time, and of the protection of low lying regions from invasion by water, enter mainly upon the domain of the interests of the cultivation of the ground, which will be discussed under the presidency of General Jilinski with whom I have the honor to share the duties of the presiding officer of this section.

As to the communications, they treat, the first, of the application of armored concrete to hydraulic constructions; the second, of the participation of the Government and of interested parties in obtaining the necessary funds for developing inland navigation, and the third, of hydrometric services, the prediction of floods and of depths of water.

Precious data and ideas, of which the interest will be further enhanced by oral discussion, will be found on all these subjects in the pamphlets distributed to the members of the Congress.

It is not without apprehension that I assume the task of directing a part of the deliberations of the first section, and I earnestly beg of you, Gentlemen, to forgive my lack of experience in these functions and to lend me your precious assistance to bring our labors to a successful conclusion.

As to the order in which the discussions are to take place, I ask your permission to recall to mind articles 16 and 17 of the revised by-laws, according to which no speaker can have the floor for more than fifteen minutes, or speak more than twice on the same subject, during the same session. Also, members of the Congress who have spoken should, within the next twenty-four hours, hand in a summary of what they have said.

At the same time, in view of the large number of persons present and the size of the hall, I have the honor to request the speakers not to begin until after taking their place on the stand, and after having given their names to the Secretary, whose special duty it is to record them.

This address was received with applause from all parts of the house.

THE PRESIDENT. — Gentlemen, the examination of the first question will now be taken up ; it is thus stated : —

How to arrange dams in rivers, in which the discharge varies greatly and which even carry large amounts of ice, so as to protect the interests of navigation and industry.

Mr. Maximoff, the General Reporter, has the floor.

THE GENERAL REPORTER reads his report.

When the speaker finishes his summing up of Mr. Cipolletti's very interesting work, he is interrupted by the President.

THE PRESIDENT. — Mr. Valentini has asked for the floor in the name of the Italian delegates to pay their respects to the memory of Mr. Cipolletti, prematurely taken away before the Congress of St. Petersburg.

Mr. VALENTINI. — In the name of the Italian delegates, I undertake here the painful task of recalling the memory of Mr. Cipolletti who died during the month of January last.

The most noteworthy part of the career of this very distinguished engineer begins in 1881, with the direction of the works of the Villerosi canals on the Ticino which were visited by the members of the Association at the time of the Milan Congress. Having, during the course of these works, to consider the important question of the discharge of wide waste-weirs, he made a very thorough study of this subject in an article which was crowned by the Lombard Institute of Sciences and Letters.

His great reputation as a hydraulic engineer caused him to be invited by the Government of the Argentine Republic, in 1888, to prepare the project and to carry on the works of irrigation of the Province of Mendoza. His mission was so well performed that, having returned to Italy in 1900, he was once more sought after by the Argentine Government, which desired to obtain the assistance of his science for a colossal work, the regularization of the regimen of the Rio Negro. Having accepted this new duty, he left Italy in the early days of last January, with the confidence given to him by his really juvenile warmth and energy. Unhappily, Death smote him even before he had reached the shores of South America.

Italy regrets in him one of her most eminent engineers whose worth was universally recognized. And, as I am sure that, if he had lived, he would not have failed to take a great part in the labors of the Congress, I feel myself still further filled with the duty of inviting the Section to salute the memory of Cipolletti the Engineer.

THE PRESIDENT. — The meeting will please rise to show its respect for the memory of the deceased Reporter. (*Approved.*)

Mr. Maximoff, General Reporter, has the floor to read the remainder of his report.

THE GENERAL REPORTER resumes the reading of his article and lays down the following conclusions : —

1. There is a tendency, everywhere that dams are built, to increase the accuracy of regulation of the level of the pool ; to handle the work more quickly and to make the operation more secure, by carrying back the action of the operating engines to the abutments or the intermediate piers ;

2. The use of a system for closing the dam, which will allow it to be thrown wide open in the least possible time, is to be desired in all cases of practice, but this condition is of essential importance on rivers subject to sudden rises and carrying large quantities of ice.

It is also to be desired that all movable parts can be taken out of the water.

The Stoney system should be placed in the foremost rank of movable dams suited to obtaining deep pools.

Dams composed of gates with movable posts have made undoubted progress, but they may be often replaced successfully by drum dams which have been fully tested. The form of the drum gives this kind of work the precious quality of allowing small quantities of ice to pass under the sustaining body without destroying the fall.

The use of movable posts is less favorable in this respect ; it is to be desired that the removal of the posts be accomplished by a movement in the direction of the current ;

3. The opportuneness of using movable dams for obtaining the head required for driving a factory during rises and while ice is running depends upon the regimen of the stream.

The maximum opening given so far to dams made in one piece is 30 metres. When the cross section of the river may be divided into a series of openings of 30 metres in width or less, the use of this system of dams seems justified. This limit may be exceeded as advances are made in the application of this method of closing ;

4. Permanent dams form a proper solution for wide streams subject to heavy ice gorges, when the holding of the surface of the pool above at exactly a fixed level is of but secondary importance.

Experience with this kind of dams dates back many years in America and can be turned advantageously to use in similar cases.

The rational form for the cross section of a permanent dam involves a vertical face upstream, a horizontal coping and a downstream face which approximates an ogee curve :

5. The defect of permanent dams is the impossibility of regulating the level of the pool. This can be corrected in certain cases by using movable crests or by adding a movable dam to the fixed dam ;

6. The various phases of freezing and of the passage of ice should be very carefully studied for rivers on which it is desirable to place dams ; the experimental study of the strength of dams under the shock of ice is also considered useful.

Such are my conclusions.

It would be interesting, undoubtedly, to have them read in English and German.

THE PRESIDENT. — I think that it would be well to make the conclusions known in German. I ask the General Reporter, therefore, to be so kind as to read them in that language.

THE GENERAL REPORTER presents his conclusions in German.

THE PRESIDENT. — I thank the General Reporter sincerely for the work which he has just laid before us.

Has any one any remarks to make ?

Mr. Deking-Dura has the floor.

M. DEKING-DURA. — I congratulate the General Reporter for the way in which he has summed up the reports, and also for his conclusions in which I heartily agree with him. All the same, I think that his judgment about the Stoney gates is a little too absolute.

I have, myself, built several dams of this system and with successful results. I think, however, that it is more in accordance with the traditions of the Congress to give out less absolute conclusions and to be satisfied with saying, for example, that the Stoney gates are among the best works of this kind.

THE PRESIDENT. — Does any one wish to speak ?

Mr. Evreinoff has the floor.

Mr. EVREINOFF. — The novelty of the problem laid before the Congress in the first question lies in the building of dams which, while so arranged as to let high water and ice run off easily, will still preserve a part of the head for industrial purposes.

Were it not for this new condition, the solution would be found in the large number of movable dams already finished. But it complicates the problem to such a degree that the most ingenious arrangements of the dams of the present time can no longer be considered as a final solution.

After examining the projects or descriptions of dams contained in the reports sent to the XIth. International Congress of Navigation, it must be noticed, in the first place, that the new projects do not give a full solution of the problem. It can be foreseen that after this Congress is over, the experts in hydro-technics will still have a great deal to do before finding, by their personal labors, a perfect solution.

Take first the report of Major Sibert. I was greatly astonished to find there the type of the permanent dam. If the question could be solved so easily by such a primitive system, it would certainly not be submitted to the deliberations of the Congress, because fixed dams have been in existence for very many years. Judging by the conclusion of the report, Major Sibert has devoted his attention exclusively to « the question of the cross section best suited to let ice pass over the dams » and not to the very constitution of the dams.

It is needless to say that none of the works described in Mr. Sibert's report is suited either to the run off of high water or to the carrying of ice. A river filled with cakes of ice and completely dammed overflows and causes more or less damage, according to the greater or less violence of the overflow.

Let us take up the three reports of Messrs. Deinlein, Cipolletti and Hansen and Malm ; those of Messrs. Schnapp and Carstanjen, and of Messrs. de Timonoff and Tsionglinski not having yet been distributed.

The types of movable dams found in the first three reports mentioned may be divided into two classes : dams of horizontal beams with intermediate piers, and dams of vertical beams supported at top by the bridge and at bottom against the projection in the floor. The first class is described in the reports of Messrs. Deinlein and Cipolletti. It is suited only to the conditions of a heavy run of ice, as dams of this sort, for reasons of economy of construction and ease of movement in operating, demand short distances between the points of support. This implies a reduction of cross section of 20 to 25 %. On the other hand, the piers set at short distances apart are the principal causes of ice gorges. Consequently I do not dwell on the reports of Messrs. Deinlein and Cipolletti.

The report of Messrs. Hansen and Malm contains some data more closely approximating the solution and material realization of the problem. It is easy to see that the authors belong to Sweden, where the free passage of ice through the dams is one of the most important questions.

The Kvarnsveden type of vertical beams (figs 3, 4, 5, Pl. I), would be quite satisfactory in its general arrangements, if the « high floor » or, better, the high permanent and submersible dam were suppressed.

I may state positively that dams with vertical beams suit the conditions of heavy runs of ice, because they have, as fixed points of support, not piers but the permanent beam of the bridge, of which the length may be — without the least difficulty of construction — quite great, reaching even 100 metres. So far as the submersible part is concerned, the Kvarnsveden dam is scarcely better than the dams described in Major Sibert's report.

As the result of such arrangements, the greater part of the cross section is not utilized for the passage of the water and

the lower strata of alluvia only find their way to the lower level by passing over the projection formed by the dam.

Assuming however that the dam with vertical beams suspended to the bridge is the only type really suited to prevent ice gorges, I think that the solution of the problem will be more nearly reached if the permanent submersible half be replaced by a submersible movable dam. No insurmountable difficulty can arise in building this type of dam. If the submersible part be constructed in accordance with the Poirée method, all that will be required when ice is running is to close it by means of curtains not only on the upstream but also on the downstream side. As to the horizontal portion, used generally as a service bridge, its shape should be made in conformity with the flow of the water.

Hence the combination of a movable dam, of the system of vertical beams suspended from the bridge, with a submersible lower movable dam, would be, in my opinion, the only solution of the problem set before the XIth. Congress.

THE PRESIDENT. — The General Reporter has the floor.

THE GENERAL REPORTER. — I accept fully the changes proposed by Mr. Deking-Dura.

As to Mr. Evreinoff's observations, they have already been mentioned in § 5 of my conclusions in which I say : « The defect » of permanent dams is the impossibility of regulating the » level of the pool. This can be corrected in certain cases by » using movable crests or by adding a movable dam to the » fixed dam ».

Hence I am not in opposition with the conclusions of Mr. Evreinoff.

THE PRESIDENT. — Does any one else desire to speak ?
Mr. Carstanjen has the floor.

MR. CARSTANJEN (speaking in German). — I accept with pleasure the change proposed by Mr. Deking-Dura in the resolution of the General Reporter. I ask however a still further generalization and especially to give up any given system of dams, and the more so as the reports of the Congress describe other systems of which the advantages are at least as great as those of

the Stoney system. Let me mention in this connection the great dams about to be built at Trollhättan, in Sweden, as well as at Poppenweiler, near Stuttgart, on the Neckar. There are also the Brahnau dam in Western Prussia, the Kolbermoor in Upper Bavaria and many others which have been in use for several years, especially the great dams of the Main, at Schweinfurt, which have been studied at previous Congresses. The openings of all these dams vary from 20 to 35 metres in width, and reach as much as 4.50 m. in height. But still greater dimensions can be adopted. Their system of closure, by means of a drum, has this in common with the Stoney system that they insure a complete stoppage by means of a single body. The drums are, beyond any question, better than the Stoney gates in the matter of simplicity of arrangement.

For this reason I propose that the second point of the resolution be worded in this way : —

« In case of heavy pressures, preference must be given to » movable dams having the retaining body in one piece and » capable of being withdrawn entirely from the water. »

THE PRESIDENT. — It would be well to have Mr. Carstanjen submit his conclusions in writing.

Mr. de Szystowsky is requested to translate Mr. Carstanjen's remarks into French.

Mr. DE SZYSTOWSKY complies with this desire and seconds Mr. Carstanjen's proposition which he finds reasonable.

THE PRESIDENT. — Does any one else desire the floor?

I propose to the meeting that the final vote be reserved until the opening of the session of Wednesday morning. The wording of the conclusions will have to be a little changed.

As this proposal raises no objection I declare it carried.

The meeting adjourned at 3.30 P. M.

FIRST SECTION

(Inland Navigation)

SECOND SESSION

Wednesday (morning), June 3, 1908

Mr. DE HOERSCHELMANN in the Chair.

The meeting was called to order at 9.30.

THE PRESIDENT. — Before beginning the discussion of the second question, the conclusions relating to the first question have to be read.

Mr. Dufourny, Secretary General of the Association, has just asked me to let him have the text of these conclusions for a few minutes. I ask, therefore, that the vote on these conclusions be put off.

While waiting, let us go on with the examination of the second question which is thus stated : —

Study of the economics, technics and regulations for operating and for hauling boats mechanically on rivers, canals and lakes. Monopoly of traction.

Mr. Merczyng, General Reporter, has the floor.

THE GENERAL REPORTER reads his report.

At the passage relating to Mr. La Rivière, deceased, the speaker is interrupted by the PRESIDENT, who proposes that the meeting rise through respect to the memory of Mr. La Rivière. (*Agreed to.*)

THE GENERAL REPORTER then goes on with his statement, which he ends with the following words :

Such, Gentlemen, are the materials which have been analyzed.

Allow your general reporter now to lay before you his conclusions. They include in the first place those proposed by the Reporter, Mr. Havestadt, and which were accepted by the special committee of the Germano-Austro-Hungarian Association of Inland Navigation.

They are as follows :

« 1° Traction on canals :

» a) No general solution can be given for the question of knowing whether monopoly of traction should be obligatory on canals ; it is proved however that increase of traffic leads necessarily to the organization of a technical service which ensures to the canal its highest efficiency. This result is obtained first by a uniformly regulated traction service to be established by the owner of the canal or his representative ;

» b) The economic and financial conditions of canals being liable to quite frequent changes, the influence of the uniformly regulated service upon the said conditions ought to be studied in each special case. But the traction monopoly, if it be granted, ought not in any case to give the right of establishing a tariff higher than what is necessary to defray the expenses of operating and to guarantee the sinking fund and interest of the capital invested ;

» 2° Traction upon canalized rivers :

» On account of the diversity of local conditions, it is impossible to formulate, for canalized rivers, any general opinion on the organization of traction. But, in this case also, the increase of traffic will force adoption of a uniformly administered traction service so as to attain the maximum efficiency of the navigable highway ;

» 3° Traction on rivers with an uninterrupted current ;

» In general, on non-canalized rivers, traction may remain free. But a traction service suited to the local conditions of the navigable highway can improve the traffic. »

I should like however to add a fourth conclusion about electric traction. Unfortunately, reports which treat of these questions are lacking.

It has been found, however, by reading reports, that electric traction has given the best results in America, France and Germany. Electric traction is, in my opinion, the best system of traction.

Consequently, I propose the following to the meeting :

« 4° Considering the important progress realized of late on » canals by uniformly regulated electric traction, the Con- » gress resolves that electric traction on canals be presented » as a question in the order of business of the next Congress. » (*Applause.*)

THE PRESIDENT. — Mr. de Bovet has the floor.

MR. A. DE BOVET. — The various reporters having taken up particularly the administrative organization of traction, I shall follow along the same line.

It is easy, I think, to leave the circulation of boats and of trains of boats entirely free in order to expect from mere competition the best conditions of speed and cost on a river in its natural state or simply regulated, as it is after all a highway of which the carrying capacity is as entirely indefinite as is that of a road on which even the defective working of one enterprise will cause no trouble to others. A few simple police rules should suffice in this case. If this be really so, I do not believe that the question of making a monopoly of the means of traction on such lines should be considered, unless it be desired to take a systematically statist view of whatever concerns the operation of everything which can be considered as a public service. The Congress is, undoubtedly, not qualified to adopt this view. At the most, the question could only be put where the velocity of the current is so great that hauling on a chain alone will give the means of reaching reasonable rates, for it does not seem to be possible either to allow independent enterprises to make use of a single chain, or to have several chains on the same section of the river. Let us make, if you will, a reservation for such a case which is certainly rare.

If the river be canalized, the conditions of circulation are closely dependent on the arrangement of the locks. An example will be given in a moment. There is no doubt that traction by trains of boats costs much less than the hauling of single

boats ; now, on the river Oise when, at a not far distant time, locks could only take one boat at once, towing was carried on by steam, in trains of which the individual elements passed the lock one by one, and by horses. Since then locks have been built to take six boats at a time ; traction is now carried on in trains of five barges and a tug which are all locked through together, and towing by horses has completely disappeared. The same tug goes all the way through now with its tow and it seems that this proceeding is better than the one which consisted in confining the tugs each to a single level. The Oise which is organized on these lines has a vastly greater carrying capacity than has the St. Quentin canal of which it is the continuation and which, before the recent doubling of the locks, had reached the full limit of what it could accomplish.

It can be said, I believe, that the rational rule to be applied as completely as possible would be the following : Make up no tow with less than the number which can be locked through together, complete it as far as possible to this number. If the locks be sufficiently large, the capacity of the line becomes, if not indefinite, at least very great, especially as the line is, ordinarily, quite wide enough for the tows to pass or overtake each other. Such a line may be considered much as a river which has simply been made regular. From the very fact of its being canalized, the current will be there quite enough under control for recourse to be had very naturally to the use of tugs and for these last to compete with a hauling (1) service, if it be thought necessary to put in the latter. Either of these methods on broad waterways seems to me as though it should give better results than does traction from the bank. As neither water nor space is lacking, I believe that the most efficacious measures to be taken on such rivers, so as best to insure the traction services, lie in the construction of locks answering to the definition expressed above and in leaving the traction free.

If this cannot be done, if the locks are only to be small and

(1) There exist especially in France two principal methods of moving barges mechanically through the water, they are called in French *remorquage* and *touage*, the former being by tugs or tow-boats running free, towing; the latter by a special boat hauling on a chain with fixed ends. The translator having never met an English word for this latter mode of locomotion has used always the word « hauling » to express it.

capable of receiving but one boat or at most two, then, although the circulation in the different levels is less difficult, I consider that a canalized river, from the point of view of our discussion, can be assimilated to a canal.

Now, the situation on a canal is wholly different. In the matter of traction, the resistance of the boat itself becomes such that there is a manifest advantage in resorting to traction against a fixed point, either horse towing, or funicular towing, or traction on the shore, or, again, hauling. If desired, exception can be made for canals of very large cross section, which, up to the present day, are exceptional ; all the same, the preceding consideration remains of a kind to cause the use of tugs to be generally done away with, as their use is not in accord with the necessities of preservation of the banks, as soon as their work becomes important.

If the dimensions of the line are restricted, it is difficult for boats to pass in opposite directions, still more so if going the same way, hence it is necessary to have more severe rules in this than in the other cases.

The use of mechanical methods must be evidently advantageous, at first glance, from the moment when resistance to motion is great, especially if speed is to be improved.

As it appears to me that the use of tugs is to be done away with generally, there remain among the processes so far proposed or tried those mentioned above, among which I shall not wander for the present, confining myself to mentioning that, according to the cases which arise, quite different conditions may have to be satisfied and consequently equally difficult solutions may have to be considered.

For places such as the summit level of the St. Quentin canal which are made very difficult by the extreme narrowness of the prism and the large amount of traffic, it seems difficult to find a better solution than hauling on the chain.

For canals with very small locks close together, as, for example on the rest of the St. Quentin canal, it will always be necessary, I think, to bring the boats one at a time and, in every case, by means of apparatus which does not have to be locked through with the boat, because if the small additional amount of time which this operation would require be admitted, the precariousness of the water supply would not tolerate

the locking through of the traction apparatus. Tractors on the bank, among other systems, give the means of satisfying this necessity which, be it said in passing, would be an additional reason to those already given to cause tugs to be rejected.

The traction apparatus is still inadmissible in the locks on canals with very long levels and few locks, but it is easier in this case than in the preceding, and sometimes, perhaps, usefully, to grant traction in small trains, with, if needs be, tractors in the levels; it is a question of kind.

Where the canals are very long and there are no locks, like those of the Ulacir system, there seems to be no doubt that the maximum of economy and efficiency should be obtained by the traction of very heavy trains and an organization which would send them ahead always complete.

This is enough to show that very different cases may come up, but there is in them all one dominating necessity, viz., to obtain a great regularity of service, either to avoid crowding and delay at the locks or to insure a constant composition of the trains and no loss of time in making them up: this alone will give the means of obtaining the maximum utilization of the line of which the capacity is very far from indefinite.

At the risk of taking up too much time, I ask to mention at least one example in support of my last contention, I will take it from the St. Quentin canal.

The canal is 93 kilometres (= 58 miles) long and has 53 locks. To go from one end to the other, at least before the very recent doubling of the locks, required from 6 to 7 days, or 156 hours of which 24 hours at most were taken up on the summit level where the traction is by hauling. Thus there remain 134 hours for the remaining 73 kilometres on which horses are used. The average speed may be taken at 1,800 metres (= 1.12 miles) an hour; a lockage requires 20 minutes; hence the 134 hours divide up into 41 hours on the road, 12 hours for passing the locks, and 81 hours lost in delays and manœuvring at the locks.

If by means of any system of mechanical traction a speed of 0.70 m. per second, or 2,200 km. per hour can be given to boats, 3 HP. per boat, corresponding to a tractile force of 300 kgs. must be expended. The trip will be made in 33 hours, a gain of 8 hours. If it be desired to double the tractile force, to raise it to 600 kgs? A speed of about 0.90 m., or 3,300 km. per hour

will be had ; the trip will now be of 22 hours or a reduction of 11 hours on the preceding case, but 99 HP. hours will have been expended in the first case, and 158 HP. hours, measured on the tow line, in the second ; the profit is at least doubtful.

If, however, with greater regularity which can be assured by mechanical apparatus under infinitely surer conditions than by live motors, only a part of the time of delay, say 50 per cent, could be saved, there would be more than 40 hours gained.

These few figures show what can be expected from mechanical traction ; a relatively small profit in rate of speed ; a profit which may be quite important by reason of the regularity of the working of the service.

It must be remarked further that towing by horses on the St. Quentin canal is very strictly monopolised by sections, and that, by means of forming this monopoly and the very rigid way in which the engineers use their police powers to insure an uninterrupted service by day and by night, this line which passed two millions of tons in 1878, and was considered then as having reached the limit of its capacity, succeeded in passing of late years, and before the locks were doubled, five millions of tons. All the same, the thought may be allowed that the substitution of a single enterprise for a series of separate ones and mechanical traction for horses, would make possible the new improvements which I have just pointed out ; and all these considerations must be taken together in order to appreciate the total possible improvement as compared with a regimen of free traction.

If this reasoning be applied to canals and boats of other dimensions and forms, other figures will be obtained, but conclusions of the same nature must be the result.

For the rest, be the matter conceived as it may, the organization of mechanical traction on a canal will involve a total of costly installations and an equipment so studied out as to suffice for all the traffic to be anticipated. If a part, and an indeterminate part of this traffic can escape, the enterprise, taking this possibility into account, will have to make its prices higher than they would be otherwise. And all the more will it have to make provision against the causes of crowding and disorganization of its own services on the same line, as these causes will be of a sort to increase costs and to lessen the best utilization of the line itself.

If then, canals being built and opened to the public at the cost of the State and under wholly artificial conditions, it be proper that the State see that they be operated for the greatest good of commerce and industry, it follows, I think, from the preceding considerations that, artificial as this solution may be, there should be no drawing back before the monopoly of traction.

If this consequence be granted, and I believe that it should be, there remains the question of determining by whom this monopoly should be operated.

It is clear that an enterprise like the one in question, being freed by the intervention of the State from having to struggle against any competition, could not have been so freed in order to enrich itself easily at the cost of the users of the navigable highway, and that the profits of the operation should be used first of all for reducing the cost of traction to the lowest possible rate. As a matter of principle, it would be legitimate to say that they should be used wholly for this.

In practice, I may be rather inclined to believe that the surest means to approach the most closely possible to this desirable result may be to give a share of the interests to the operator, with the condition that this share be properly limited and be made to depend on the effort put forth to obtain the maximum of improvement for the service. This is a matter for a rationally drawn up contract and specifications. It may not be easy, but surely there is some way of preventing too much indolence or, at least, insufficient activity in the pursuit of the possible best being the result of too much security.

THE PRESIDENT. — Although the regulation fifteen minutes are up, I ask the meeting to allow the speaker to continue his remarks. (*Agreed to.*)

Mr. DE BOVET. — I shall only take a few minutes more.

If it be desired to set aside the regimen of concession, that of an interested administration seems infinitely more to be recommended than that of direct management by the State which, to my mind, seems capable of exact definition by the expression uninterested administration.

For my part, I consider that the State is a poor operator not only when it is a question of operations requiring commercial capacity and knowledge, as Mr. Marlio admits, but even when

it is a question of technical matters. I will add at once that this has nothing to do with the capability of the agents which it employs, it lies in conditions which are so different from those which are applied in the industry in which the latter are to be used.

Should proofs be called for to support this opinion? I am convinced that none of you will take long to find them. Circumstances make it my duty to seek them only in my own country, but I think that I shall not be contradicted, for example, by any of those who are condemned to use the telephone in Paris.

The creation of a State monopoly can be conceived when it is a method of collecting a tax; but there is nothing of the sort here, and, outside of this case, the fear may be permitted of seeing the extension of direct seizure by the State of purely industrial operations and of seeing the way opened to socializing means of production so dear to collectivist schools.

The statement that a monopoly like this can be a « tool of political economy » to the advantage of the State will not go far. I think, toward lessening this impression nor toward calming the apprehensions of those who think that, making politics runs a strong risk of not being the means of making good political economy.

I mean to specify clearly that I rise here against direct management by the State and not against the intervention of the State which obtrudes itself beyond any question, as it intervenes by the very constitution of the monopoly, if recourse be had thereto, as it likewise intervenes by preparing specifications if the regimen of concession be adopted, as it also intervenes in the case of the interested administration if that be preferred, as it intervenes again in a last form, which is among those which are, I believe, worthy of serious consideration, if it be desired to resort to the creation of a « public establishment » of the sort, for example, of certain great autonomous ports. Let me say, in passing, that a comparison between the ports endowed with this system and those which are still subject to direct management by the State, seems to me to give a very solid argument against the latter and let me add also that, when it is a question of an establishment of this nature, it would be worth while to consider whether it would not be advantageous to turn over to it not only the operation but, perhaps, the

construction of the navigable highway, and so realize the desideratum of clear minds which would require that construction and maintenance on the one side, and operation on the other, did not ignore each other as they do at times and as a few of the reports have pointed out.

Let me add moreover that these are questions which come under the legislative competence of each country, which lie in the domain of their Governments and in which such a Congress as the one which brings us together here has no right to take part.

I believe that it would be unwise to mention them in the resolutions which we may be called on to express and I think that, while leaving to each country the care of examining the way for obtaining a result conformable to its temperament and legislation, the Congress can go no further than to pronounce upon the question of determining whether monopolies of traction should be formed on navigable highways.

For my part, I consider that such a question is only applicable to canals and canalized rivers when the conditions of operating the latter can be assimilated to those of a canal and that, when the traffic on a canal becomes sufficiently important to justify setting up an organization for mechanical traction, it is well that the establishment which has the work should also have a monopoly of the traction.

The General Reporter, Mr. Merczyng, is a partisan of the same principle, with this reservation, that the monopoly should expire when the capital has been paid back. Why put an end to the monopoly after amortization and then fall back into the same state of anarchy? The question at issue is to determine whether monopoly is to be adopted or not. So far as I am concerned, I consider that monopoly should be adopted and be maintained indefinitely afterwards.

THE PRESIDENT. -- Allow me to interrupt the discussion so as to give the floor to Mr. de Timonoff, President of the Committee of Organization of the Congress.

Mr. DE TIMONOFF reads the following translation into French of the telegram addressed to the Congress by His Imperial Highness the Grand Duke Michel Alexandrovitch.

« I am delighted to transmit to the members of the Congress
» the following telegram received to-day from H. M. the Czar : »

« I beg your Highness to transmit to the members of the
» XIth. International Congress of Navigation, my profound grat-
» itude for the sentiments which they have uttered. With all
» my heart, I wish them every success in the solution of ques-
» tions which lie so close to the economic well being of the
» countries which they represent.

(Applause.)

» (Signed) MICHEL. »

THE PRESIDENT. — Gentlemen, the discussion of the question will be resumed. The General Reporter has the floor to answer Mr. de Bovet's remarks.

THE GENERAL REPORTER. — Mr. de Bovet has just said that I proposed in my conclusions to have the monopoly cease after a certain period of time. The exact text is : —

« The traction monopoly, if it be granted, does not in any
» case give the right of establishing a tariff higher than what is
» strictly necessary for the amortization of the capital invested. »

Mr. SCHWANGENBACH gives in German a résumé of Mr. de Bovet's remarks.

THE PRESIDENT. — Mr. Marlio has the floor.

Mr. MARLIO. — The honor of addressing you to-day as the reporter for France, does not efface in me a real feeling of sadness, as my being appointed reporter is due to the death of Inspector General La Rivière, whose memory the President and the General Reporter have just honored.

My first words will be, therefore, to thank these Gentlemen in the name of the French delegates for the words of regret which they addressed to that large hearted man of eminent learning, Mr. La Rivière.

The idea which I wished particularly to bring out in my report is that, until late years, only a secondary importance was attached to the operating of navigable highways, or more accurately that this operating did not exist. Lines have been built or improved and then left to an ignorant and unorganized

boating service. The guiding thought was that the navigable highways, *water roads*, should put up with the same regimen as *land roads*. It was concluded from this that the former, like the latter, should be *gratuitous* and *free*. The dogma of gratuitousness is not on trial to-day. It is that of liberty which is the object of our meeting.

Absolute liberty of navigation has generally produced only anarchy; no coordination is established between the efforts and progress of the line, the floating stock or the motor. Each of these elements is changed and transformed without regard for the others. As to the methods of work of the boating industry they are what they were two centuries ago.

Should the State stop at noting this state of things, at regretting the chaos? It has been called upon to intervene by the very force of things, and this for two main reasons: —

1. A large number of our canals succeed at the present time in carrying a traffic of 2 to 5 millions of tons. Crowding would be very common on lines so heavily burdened if the State, which owns the lines, did not step in to regulate the circulation;
2. The applications of machinery are becoming every day more numerous and more important and, in order that navigation may reap all the benefits that they can give, the use of perfected machines must be minutely regulated.

Traction, especially, will profit by the development of the applications of machinery and this leads us to the question which is about the only one on which our colleagues have touched.

Mechanical traction is of a sort to bring about a reduction of the cost of water transportation in the future. Even now, for the same cost, a much higher speed can be had. Hence it is of interest for the manufacturer. It is the same also for the State which finds in its use a means for increasing the capacity of the line and of putting off, for a long time, expenses which would be necessary without it. Hence the development of mechanical traction is desirable on canals carrying a heavy traffic. But the putting of this sort of traction to work requires both strict regulation and large capital, and for these two reasons, *technical* and *financial*, a more or less absolute *monopoly* is necessary.

Should this monopoly be intrusted to private parties? I believe not. The connection between the body of the navigable highway itself and the traction plant established on its banks is too close, it raises up too frequent and too difficult relations between the agents representing the two interests for good results to be hoped for outside of a single management. On the other hand, in order not to compromise the general interests which it has in charge, the State is obliged to foresee the case in which it would have to deal with an irresponsible party and to insert in the specifications of the grant somewhat draconian clauses which would frighten the best bidders and keep them away. This trouble becomes more marked as the Constitution of the State is more democratic, because it has so much less liberty in the choice of the grantees who offer themselves.

Why not intrust the monopoly to the State which administers public services in the general interest and not with an eye to profits? The canal is a tool which belongs to the State; the State has already assumed charge of displacing boats vertically, as it pays the lockkeepers; why should it not do the same thing horizontally? Private parties who show themselves to be such statisticians when it is a question of making the State pay the cost of constructing or improving a canal, are inconsistent when they afterward refuse it the right to make the utmost possible out of the tool which itself has made or improved. It would ill become them, then, to speak of *liberty*, because, according to the very true expression of Mr. Peters « he is not free who cannot supply his own needs. »

The State is reproached with its incapacity in managing monopolies. This is often right when it is a question of showing commercial capacity. It would be false where technical knowledge is most needed. Besides, most European railroads are in the hands of States which are able to provide for the operation which is far more complex than the equipment of a canal.

Besides, less in France than elsewhere is the abuse of a State monopoly to be feared. These abuses would be impossible in the presence of the competition of the railways which are in the hands of private companies.

Is direct administration by the State, however, the only point to be considered? I trow not. A great many mixed solutions can be imagined in which this monopoly of the State will be

handled by an operating society, or by an interested administration or better still by a public establishment formed with the joint efforts of interested parties who furnish the funds and have the right of initiative in the matter of rates, the State reserving to itself the technical direction and the approval of the proposed tariffs. The advantage of this solution would be reconciliation of the necessary control of the State with the spirit of enterprise and improvement of private industry.

I had in mind, in my article, the canals on which the question of the monopoly of traction is an urgent matter. It is evident, to my mind, that there is now no necessity for this monopoly on our free or canalized rivers where crowding does not exist and where free towing gives excellent results. Must we go so far, however, as Mr. de Bovet and condemn absolutely and in all cases, monopoly of traction outside of canals? I do not think so. It may happen and the case has arisen that certain societies, certain powerful syndicates think sometimes of seizing all the transportation of a river. This syndicate thus forms a monopoly of the most dangerous kind, a private and hidden monopoly at the cost of private parties. This monopolizing has arisen for the transportation of coal on the Rhine, the Mein and the Dortmund-Ems canal.

I consider that if this ill-omened tendency were to be developed and become general, it might be well for the State to take the monopoly in hand for the greater good of industry and even for the preservation of liberty.

Mr. SCHWANEBACH gives in German a résumé of Mr. Marlio's remarks.

THE PRESIDENT. — Mr. Ragoczy has the floor.

Mr. RAGOCZY (in German). — The General Reporter has been so kind as to point out the situation of navigation in my country as being particularly instructive in examining the present question. He mentions also the project of a committee of the Germano-Austro-Hungarian Association of Inland Navigation which had pronounced in favor of a more extended application of the monopoly of traction and of electric towing. The general meeting of the Association, however, did not accept this view and rejected the project by a large majority. The reporters,

Messrs. Bredow and Teubert insisted on the monopoly by calling up the injuries done to the bottom and slopes of the canals by steamboats. Now, to avoid these troubles, it is only necessary, to adopt another cross section and to give motor navigation a much greater development. The acceleration of traffic is not as necessary for the interests of navigation as for those of technical administration. Crowding at locks, as a matter of fact, can never be avoided entirely, because navigation is an industry of seasons which depends upon the movement of the water; furthermore, repairs to the locks often interfere with navigable highways during long months.

Electric towing was applied first to the Teltow Canal. It was opened to traffic only a year-and-a-half ago and has not yet shown, therefore, the measure of what it can do. The year just past shows a traffic of 300,000 tons. It is only a beginning and heavy losses have been the result; perhaps, ten or fifteen years hence the enterprise will pay. The Teltow Canal cannot be quoted now as a conclusive example of the advantages to be obtained from electric towing and monopoly of traction. Furthermore, the charges are higher than for towing by steam or by horses.

Monopoly of traction should not increase further the omnipotence of the State. After what has taken place on the canal from the North to the Baltic seas, there is good reason to doubt the State's being able to have always at hand a sufficient number of tugs in the region of the lakes, and moreover, it is also known that it is impossible for it to have everywhere the necessary dredges. Hence the future of inland navigation does not lie in the monopoly of traction in the hands of the State; it depends rather on the greater extension to be given to motor navigation. Technical improvements will remedy the troubles still found in the use of large motor barges in strong currents.

The studies of Messrs. Sympher, Thiele and Block on the electric traction of boats are noteworthy, but they do not pretend to have met with absolute approval. They end by showing that the regulation sought must be had by other means. If it be desired that one third of the period of navigation be taken up by the trip proper, and two-thirds by loading and discharging freight, we should reach a more practical operation, reduce the periods of standing still, the length of manœuvres by improving the turning places in ports and releasing the boatman

from assisting in loading or discharging freight. The consignee should furnish a crew specially trained for the work.

It is difficult, if not impossible, to solve the question for all countries, as the French reporter, Mr. de Bovet, and the English reporter, Mr. Sauer, have remarked. The opposing causes are, notably : —

1. Differences of conditions of construction for different canals ;
2. Different intensity of traffic on each ;
3. Different uses to be made of them ;
4. Diversity in the development of navigation on canals ;
5. Different objects sought by the hydraulic service of each country ;
6. The different tendencies of the political parties in parliaments.

I think, for these reasons, that I can recommend giving up a monopoly of traction as a rule. And, as electric towing as applied on the Teltow canal has not yet shown any technical or economic advantages, I propose that this question be laid over for the next Congress.

Mr. DEKING-DURA translated Mr. Ragoczy's remark into French.

THE PRESIDENT. — The General Reporter has the floor.

THE GENERAL REPORTER. — Mr. Ragoczy has just told us that the conclusions of the special Germano-Austro-Hungarian committee were not adopted by the Association. I accept what he says, but I hold, none the less, to my conclusions, without troubling myself whether that Association accepted them or not.

THE PRESIDENT. — Mr. Léon Gerard has the floor.

Mr. LÉON GERARD. — The discussion of the regimen to be adopted in organizing electric traction on navigable highways has been carried on so far with economic data or with political or administrative considerations as points of departure.

Allow me to defend the opinion that the regimen to be adopted in this matter depends especially and essentially on purely technical considerations.

In establishing electro-mechanical means of traction on canals, one or more of the following objects are sought : reduction in the cost of transportation, increase of useful speed, regularity of transfers, better utilization of the floating stock, and increase of capacity of the navigable highway for traffic especially by quicker manœuvres at the locks, obtained by electricity, and by the establishment of points where vessels are loaded and discharged mechanically, and, finally, by increasing the water supply by means of electric pumps.

The improvement of the speed regimen and of the coefficient of utilization of the plant cannot possibly be had without a monopoly given to mechanical methods. If there be one point in regard to transportation which has been settled practically, it is this fact that mingling speeds on the same line even when the circulation is light, practically reduces the speed of the fastest units to the commercial speed of the slowest.

The right of overtaking and passing, arrangements made by regulation, the efforts of the personnel in charge are vain. For years we have seen the mechanical traction of the Deûle reduced to speeds of less than 2 1/2 kilometres an hour when it had at its disposal the means of operating at 4 kilometres if mechanical means of traction had been the only ones authorized.

Now, the example mentioned does not tend merely to show that increase of speed, one of the essential objects of the mechanical establishment, was not reached by reason of the absence of monopoly, but also that the better utilization of the floating stock, the better pay of the crews and the normal remuneration of the capital employed in traction were not realized.

In case of a congested traffic like that of the canal taken as an example, the adoption of a higher speed would have represented for the boating industry an increase of receipts in the ratio of 4 to 2 1/2 and from the point of view of the traction plant, the increase of receipts would have been in the same proportion, while the outlays for general expenses, interest and sinking fund of the plant, lines and central station would have remained sensibly the same.

Now, in the matter of electric operating, these last items of expense are relatively large, as will be seen further on, as compared with the direct cost of fuel and labor.

It follows from these considerations that the logical organization of mechanical traction on a navigable highway implies the unit of speed and hence the monopoly for mechanical means, and that this fact is the essential result of technical necessities alone.

The realization of the advantages of mechanical traction is connected intimately with this condition : increase of speed, better utilization of the boating industry, better utilization of its stock and of the canal capital, better remuneration of the capital engaged in mechanical installations and reduction on this account of the cost of towing.

As to the mode of distribution of energy, I think that there is none better than the electric form, especially since motors working with a monophasic current have become practical. This system allows distribution to a very great distance, it avoids cost of superintendence and labor and the high losses of effectiveness at the sub-transformation stations from a high alternating tension to a low continuous tension.

The elasticity of electric motors makes their use precious in towing.

The possibility of manœuvring the locks, of lighting the navigable highway, of handling freight on the landings, of dredging and making repairs and supplying water by obtaining energy from a single source of supply, a well organized central station, are the precious advantages of electric distribution.

In the matter of the time which must be considered for a towing organization, whether as a grant to third parties, whether as the exploitation under lease or on shares of a given system, it seems to me hard to admit a limit of less than thirty-five years and better to fix this time at forty years.

Once more this factor is not determined by political or theoretical questions, but by mathematical considerations in a way laid down by amortization tables.

Unless a heavy tax be laid on operating expenses, a large part of which is made up of interest costs and sinking fund, and, consequently, unless rates be increased, a sufficient lease of life should be guaranteed to the enterprise be its form what it may.

In fact, in matters of electric and mechanical traction, wear and tear of plant, the chance of changes due to improvements, risks of all sorts justify providing for interest, sinking fund and means for renewal or other carefully estimated purposes.

It is not excessive to put industrial interests on the capital engaged at 5 % and to provide also a sinking fund at this rate, that 2 % shall be turned over to contingencies and renewal. If the time for paying off the debt be forty years, the financial service of the capital engaged in the enterprise will have to yield, on this basis, about 8 % to cover interest, sinking fund and normal risks. If, on the contrary, the proposed organization gave but ten years to accomplish the same effects, the enterprise would have to carry an *additional charge of 7 %*, or a total of 15 %.

The result would be that for a system of electric traction costing 50,000 francs per kilometre (= \$15,600 per mile) and having a traffic of 2,000,000 tons the first method would tax the cost of traction, for the financial service alone, with 2 millimes of a franc per ton-kilometre (= 0.06 cents per ton mile), whereas the short term organization would tax it with 3.75 millimes (= 0.113 ct). Assuming that the direct expenses and those of operating be 2 1/2 millimes, the first method would give a reasonable rate of 4 1/2 millimes (= 0.127 ct) whereas the second would require the adoption of the excessive rate of 6.25 millimes (= 0.177 ct).

These therefore are purely mathematical considerations which lay down the necessity of giving to the organizations administering a system of mechanical traction a sufficiently long life.

So far as the classification of navigable highways is concerned where towing should be organized or left free, I do not share Mr. Bovet's opinion. Physical classifications into rivers, canalized rivers and canals cannot be used as a basis. It is the relative extent of the mechanical installations, of the sums to be invested in special works and of the cost of maintaining the navigable highway which determines the form of operating and the necessity for organization. Even assuming that the State fix its share of the funds to be sunk in constructing a navigable highway, so far as operating the traction plants is concerned, it is a matter of no moment whether this line be a dredged river, a slackwatered river or a canal. The only essential point is to know the capital engaged, how it is remunerated

and the means suited to allow of assuring an intensive exploitation and one which yields a good profit on the whole amount. Hence we must seek how to obtain an income for the capital to be paid in with a view to obtaining the means of traction and to make the traffic more intense and not to determine this regimen by the nature of the natural or artificial waterway.

A great fluvial navigable highway, the Po for example, might become one of the great lines of exchanges of the centre of Europe if a complete traction organization existed along its course and that of the adjacent canals.

Such a result could only be reached if the income producing capacity of the funds invested both in the artificial canals and in the dredged river were assured, and this could be done only by a single organization of the means of traction both on the canals and the river which the canals command above and below.

Many other examples tend, in my opinion, to weaken the proposition of our eminent colleague ; I shorten the discussion on this point.

From the point of view of the *civil person* which is to assure the administration of a traction enterprise, absolutely opposite opinions have been put forward : the statist thesis, so warmly espoused by Mr. Marlio, has had opposed to it the French example of the very imperfect working of the telephones.

It seems to me difficult to solve, *ne varietur*, this question. There are examples of good and correct management of communal administrations in some large centres and for relatively easy industries. On the other hand, how many examples there are of State incapacity in matters of commercial initiative ! There are in every nation tendencies and preferences which prevent a generalization of principle in this matter.

It appears to me evident that when it is a question of developing or creating a traffic, of bending the organization of freight carrying to the needs of commercial traffic, private initiative is far superior.

Alongside of these antagonistic forms, there is a system of mixed operating which has given excellent results : it is that of farming out for a limited time the installations which remain the property of the State.

The creation of organisms which include the State, provinces, districts and private parties has given good results and has

often given the solution for the most difficult economic problems of the kind now before us.

In this order of ideas, the organization of the Society of Belgian Local Railways, that of the Society of the Installations of the Brussels Maritime Canal, of the Society of the Port of Bruges, intercommunal associations like that of the Teltow District at Berlin, of which the works have been admired on our way to this Congress, are so many examples which should not be disregarded in examining this question.

So far as the *system of traction* is concerned, it is an infinite pleasure for me to note that the reporters have retained in their examinations only the system of traction on smooth rails and that of proportional adherent traction on a raised rail. Since the works which I communicated to the Düsseldorf Congress in 1902, on the conditions of towing apparatus on two smooth rails, I have assisted in bringing about a certain advance by the construction of light tractors of which the adherence is due not to weight alone but to the action of the pull of the tow line.

I think that, along with the two systems mentioned by the reporters, it is useful also to provide in certain cases electric traction by a submerged cable, which would be particularly advantageous in the matter of first cost.

The regret has been expressed in our section, that our work has been devoted exclusively to the economic and administrative sides of the question of electric traction; I think therefore that I may give pleasure to my colleagues by yielding to the request of Professor Merczyng. I accept the kind invitation extended to me by the Imperial Institute of the Engineers of Lines of Communication to describe briefly those of the American canals on which our colleagues of the West have carried on researches to determine the best type of tractor to be adopted in view of local conditions.

This communication will be made immediately after the lecture of Baron Quinette de Rochemont at the same Institute.

THE PRESIDENT thanks Mr. Léon Gerard for his remarks and particularly in the matter of the lecture which all the members of the section will be happy to attend.

He then calls upon Mr. Krassny.

Mr. KRASSNY (in German) says that he is a partisan of State monopoly limited to canals, canalized rivers and public streams, in so far as they may not be subject to international regulation. He bases his opinion on technical and economic experience already acquired, and on the needs of traction on navigable highways. As the reports have shown, irregularity of navigation hurts the banks, the cross sections and the care of canals; it causes delays and injuries. It is unjust therefore that the supplementary cost of renewing and increasing the installations should be assumed by the State or the proprietors of streams, because the economic calculation in this case is made false. If a comparison is to be made with a normal exploitation, the costs should figure among the expenses of traction.

The regulation of traffic, as on railways, is a technical and economical necessity. Hence it is not a question here of choosing between free competition and monopoly, but between State and private monopoly. Private monopoly is reproached for its natural tendency toward a financial exploitation to the detriment of outside interests, in addition to the difficulty of superintendence from the technical point of view and from that of the application of freight rates. The speaker refutes the arguments arising from fear of State omnipotence, of bureaucratic administration and fiscal operations, and he agrees with the views of the General Reporter. He proposes, however, to add an amendment reserving a special treatment to international rivers in accordance with an engagement made by the interested States.

M. DEKING-DURA translates into French Mr. Krassny's remarks.

THE PRESIDENT. — Mr. Brelow has the floor.

Mr. BRELOW says, in behalf of his collaborator Mr. Teubert, who was prevented from being present at the Congress, and in his own name, that he agrees with the conclusions of the General Reporter.

THE PRESIDENT. — Mr. Roundo has the floor.

Mr. ROUND. — My honorable predecessor on this stand, Doctor Krassny, has just said that the conclusions adopted by the Congresses are in no sense obligatory and can only be

considered as advisory. But, Gentlemen, I am convinced that this advice, coming from an assemblage clad with such great scientific authority, becomes a powerful rallying cry of a nature to influence the further development of the question. This, in my opinion, is why it is to be wished that the Congress be prudent in expressing its conclusions and that it avoid theses which are not solidly founded on theory and fully borne out in practice.

However audacious my opinion may appear to the many partisans of traction from a motor on the bank, I must oppose any conclusion which may tend to take away towing by a screw propellor from the number of systems suited to remedy the objections to animal traction and able, in certain cases and under certain local conditions, to serve as the base for a perfectly rational installation from both the technical and economical points of view. To state generally and unrestrictedly, as Dr. Krassny does implicitly, that towing by screw propellers is injurious to canals and, hence, that it is more expensive than any other mode of traction is, to my mind, going contrary to the facts. We have heard ardent defenders of the monopoly of traction — especially the non-technicians — dwell, as on an axiom, on the opinion that screw tugs destroy canals. We should speak accurately. And when an argument is drawn from the hurtful influence of the screw, from the increase of the resistance of boats to traction caused by the back lash of the screw, from the difficulty of guiding trains of towed boats and from other similar grievances, we should not forget to take into account the rate of speed and also the relation existing between the wetted section of the canal and the section of the boats at the midship frame in each given case.

Experiments made in Russia on the canals of lake Ladoga, which are the object of the report presented to our Congress by Engineer Tsionglinsky and your servant, have shown that unfavorable effects are only produced at a speed higher than 4 to 5 kilometres an hour on canals having a large wetted section (about 60 square metres and upward); that the total of these effects may be neglected in comparison with the climatic injuries caused on northern canals by the rude influences of the winter season. These results, which are borne out by the minute researches of Mr. Haack on the Dortmund-Ems canal,

allow the conclusion to be drawn that the theory of the hurtful influence of propellor wheels on the cross-section of the canal — whatever may be the relative dimensions, speeds, etc., — cannot be reconciled with the strict data of experience.

On the other hand, the rapid progress in the search for rational forms of screws, to mention only the works of Professor Lorenz, at Danzig, and the constant perfection of methods for protecting banks (new Decauville types), allow the positive statement to be made that the last word has not yet been said on the use of screw propellers on canals. It is the domain of future researches, of experiments on a large scale on sundry canals, in trial tanks of hydrotechnical laboratories and of special installations (Uebigau).

THE PRESIDENT. — Mr. Sympher has the floor.

MR. SYMPHER (in German) proposes to adopt the motions of the General Reporter without change and without adding Mr. Krassny's proposals, which, by the way, he approves entirely. Two opinions have been brought forward in the hall : one desires as wide liberty as possible on navigable highways, the other recommends the strictest monopoly of traction. The first system is defended by Messrs. Bovet and Ragoczy, the second by Mr. Marlio, but even he makes some concessions to liberty. The General Reporter's view takes the happy medium between the two opinions, and I believe that, if some of the speakers had known sooner Mr. Merczyng's proposals, they would have accepted them.

So, to sum up. Regularity must be had on thronged navigable highways, and especially on narrow canals. This necessitates certain restrictions to the regimen of absolute liberty, but we do not wish to impose any determined system of traction. It is hard also to *prescribe restrictions* for all navigable highways, for example on open or little frequented streams.

With this understanding, I stand particularly by the fourth or last proposition of the General Reporter, reserving the question of the best system of traction for the deliberations of the next Congress.

MESSRS. MEYER, SMRCEK and HAMEL speak successively in favor of the conclusions of the General Reporter.

THE PRESIDENT. — Mr. Collard has the floor.

MR. COLLARD. — I consider that the discussion has widened out and that the remarks of the various speakers have gone beyond its exact object. I think that the conclusions of the Congress might bear on the two following points : —

1. Does not monopoly of traction become an absolute necessity at some given moment on canals where the circulation is heavy if these canals are to render the full service expected when they were built and which was the reason for the sacrifices made by the State ?

2. Monopoly being deemed inevitable, to whom should it be granted ? To the State, to a corporation like a Chamber of Commerce or to a Society formed expressly to put it into operation ?

My own opinion is that monopoly is inevitable and that it should not be entrusted to the State.

THE PRESIDENT. — I think that I should call the attention of the meeting to the fact that we ought now to call the second session of to-day to order ; but we have not yet closed the first.

We must not delay further. I therefore ask the General Reporter to read his conclusions again.

THE GENERAL REPORTER reads once more the text of his conclusions.

The meeting then votes on the conclusions which are carried without opposition.

The meeting adjourned at 1.15 P. M.

FIRST SECTION

(Inland Navigation)

THIRD SESSION

Wednesday afternoon, June 3. 1908

Mr. DE HOERSCHELMANN in the chair.

The meeting was called to order at 2.30 P. M.

THE PRESIDENT. — The order of business brings up the third question of the programme ; it is stated as follows :—

*Equipment of Ports of Inland Navigation,
especially the advance made in electric plants.*

As the General Reporter, Mr. Romanoff, is not here, I shall ask Mr. Maximoff to have the kindness to act as his substitute and to read his report.

Mr. MAXIMOFF complies with this request and mentions, as he finishes reading, that since the general report was printed a new article has appeared by Mr. Bela de Gonda, Section-Councillor in the Royal Hungarian Department of Commerce. This article, however, does not answer the third question ; it is rather the sketch of a preliminary project for a port at Budapesth.

THE PRESIDENT. — As Mr. Romanoff is absent, the Executive Committee, taking its stand on the summary statement of the question which Mr. Maximoff has been so kind as to make to the meeting, proposes to call for a vote on the first conclusion of the report prepared by Messrs. B. Gervais and L. Tsimbalenko.

Mr. Maximoff will therefore please read this conclusion.

Mr. MAXIMOFF. — Here is the text of this conclusion modified in form : —

An inland navigation port should satisfy the following conditions : —

- « 1. To be established in a manner to serve best the interests
» of works and manufactories of the locality in question ;
- » 2. To provide : —
 - » a) Convenient and accessible transfer stations between the
» waterway and railway ;
 - » b) Places for temporarily storing goods about to be reforwarded ;
 - » c) Special docks suitable for goods of different kinds ;
 - » d) Quays and other landings suited to the nature and importance of the traffic and extending as far as possible towards the centre of the districts to be served. »

THE PRESIDENT. — Does any one desire the floor ?

As no one desires to speak we will pass on to the vote.

The conclusion is adopted unanimously by the members present.

THE PRESIDENT. — We have still to vote on the conclusions of the first question, laid over at our first meeting.

Mr. Maximoff, General Reporter, has the floor.

THE GENERAL REPORTER. — I first came to an understanding with the speakers who took part in the discussion : —

The following conclusions were agreed upon : —

- « 1. These points should be observed in the construction of dams : —
 - » a) The level of the surface of the pool should be regulated
» as accurately as possible ;
 - » b) Quickness of working should be assured and its safety
» be increased by placing the operating machinery on the permanent works ;
- » 2. It is important that the whole width of the dam should
» be opened as quickly as possible, especially on rivers subject
» to sudden rises or carrying large amounts of ice ;

- » It is well to be able to withdraw from the water all the
» movable parts of the work ;
- » Dams with movable gates and supports, and also drum
» dams have been fully tested.
- » The latter have the advantage of allowing a certain quantity
» of ice to pass without reducing perceptibly the level up
» stream ;
- » 3. The system of movable dam which, if needs be, furnishes
» the means of maintaining, during the passage of floods and
» ice, the head of water required for driving the factories which
» use it, depends upon the regimen of the stream. There are
» to be found already at many places, dams of the kind which,
» in a single piece, covers an opening 30 metres in width ;
- » 4. Fixed dams are advisable for wide rivers liable to heavy
» accumulations of ice when the level of the upper pool need
» not be exactly preserved ;
- » 5. The defect of fixed dams, which do not allow the level
» of the pool to be regulated, may be remedied in certain cases
» by making the upper part movable or by building a movable
» dam alongside of the fixed dam ;
- » 6. The study of a dam should be accompanied by observa-
» tions on the way in which the ice forms and on the way in
» which the cakes of ice are carried by the river ; it requires
» also a knowledge of the conditions under which the work
» has to stand the impact of the ice. »

THE PRESIDENT. — Does any one offer any objections ?

As no one asks for the floor, I declare that the conclusions are approved by the Section.

The meeting adjourned at 3 o'clock.

FIRST SECTION

(Inland Navigation)

FOURTH SESSION

Friday afternoon, June 3, 1908

His Excellency General JILINSKI in the chair.

The meeting was called to order at 3.45 P. M.

THE PRESIDENT : —

Gentlemen,

To-day's session is devoted to questions closely connected with agricultural hydraulics.

As one of the Presidents of the first section of the Congress, it gives me pleasure to open this session with my wishes of welcome to the eminent members of the various civilized nations which they represent, and to express the conviction that this first attempt of the engineers of navigation to work together with the engineers of agricultural hydraulics, will contribute to the satisfactory solution of the few problems of the caring for and direction of water for the needs of navigation and agriculture.

Before beginning our labors, you will allow me briefly to lay before you, Gentlemen, the present situation of the works of improvement in Russia, as they differ essentially from those of the same sort in Western Europe not only by reason of climatic conditions, but also of the great extents of land which suffer from excess or lack of moisture of the ground and which, on that account, have either to be drained, or to be irrigated and supplied with water.

It seems well to mention, Gentlemen, that for men who come, as do most of you, from countries where the practical science of agricultural hydraulics has an already old and very beautiful history, this science will seem very new in this greater country where its application has developed sensibly only toward the end of the last century.

I am going to lay before you the different phases of this development.

European Russia has an area of more than 400 million hectares (1) (= 1,544,400 square miles). This immense area should be divided, in conformity with climatic and hydrogeologic conditions of the ground, into two unequal parts, of which the first or Southern has a surface of 100 millions of hectares (= 386,100 square miles), and the second or Northern, exceeds 300 millions of hectares (= 1,158,300 square miles).

This latter, which includes the larger part of European Russia, abounds in water and atmospheric precipitations and it suffers from excess of dampness.

Hence it follows that the most urgent task of the agricultural hydrotechnic service in this region would be the drainage of marshes and marshy earth.

The southern part, on the contrary, although its conditions are very favorable in the fertility of the soil (tchernoziom), suffers from drought under the action of a warm and, in spots, of even an extreme climate.

This region needs artificial watering, that is to say irrigation, in order to turn to account the natural richness of the soil.

As far back as the early part of the last century a few isolated and quite rare attempts at drainage were made in Russia; but it was only from and after 1875 that systematic and more important drainage works were undertaken.

The major part of these great drainage works were carried on at first in Polessia, a region of Western Russia which occupies a surface of 8 million hectares (= 30,900 sq. m.); one-third of this surface has been opened up by a system of canals of 5,300 kilometres (= 3,300 miles) in length.

This country was only thinly populated before drainage.

(1) 1 hectare = 2.46 acres; 260.16 hectares = 1 square mile.

In Central Russia, the works were applied, at first, to a few marshes of the most thickly inhabited governments : Moscow, Riazan, Vladimir and Tver.

About 60,000 hectares (= 231 sq. m.) of marshes in these governments have been drained by canals.

These canals were built with a double purpose : of draining the marshes and of establishing rafting communication with the adjacent rivers.

Twelve hundred kilometres (= 750 miles) of canals have been built in these four governments.

In Northern Russia, a network of canals has been put in over an area of 110,000 hectares (= 423 sq. m.) in the governments of St. Petersburg, Pskoff and Novgorod.

The steady advance in carrying on these works allowed immense tracts of inaccessible marshes to be transformed into land suited to human labor.

This land was gradually covered by pasture land, meadows, cultivated fields and forest vegetation.

This result contributed greatly to making the country more healthy and, consequently, better suited to the development of colonization.

On the other hand, beginning with 1880, irrigation and water supply works were started in the South of European Russia.

The topographical and hydrometric peculiarities of this flat region, poorly supplied with spring water and deprived of the water coming from the everlasting snows of high mountains, made it obligatory to use atmospheric precipitation.

Hence, resort had to be had to special constructions intended to store up atmospheric water and to direct it in accordance with the needs of the country.

The last twenty-five years have been devoted to this work which has endowed Southern Russia with a series of different types of hydrotechnic constructions suited to local needs.

At the same time, irrigation has been started in a certain number of sections which have served for several consecutive years as a field for experiments in irrigation.

These experiments were intended to cast light on the choice and mode of watering as well as the different crops to be grown on the irrigated lands.

They also taught us the economic result and the influence of irrigation on the districts where it has been applied.

Finally as drinking water was lacking nearly everywhere, it was obtained either by means of reservoirs for atmospheric water, or by ordinary wells or again by artesian wells.

Toward 1895, hydrotechnic works crossed the Ural mountains and passed into Western Siberia where they were applied to colonization.

There, the immense Baraba marsh required important drainage works.

Quarter of the total area of 4,370,000 hectares (= 16,800 sq. m.) of this marsh was drained by means of 1,835 kilometres (= 1,145 miles) of canals.

In the Schim steppe, there were great hydrotechnical difficulties in obtaining fresh and not brackish drinking water.

Trials were made in this steppe on 792 lots of ground belonging to emigrants; a water supply was assured in 194 hamlets by means of 1,113 wells.

Besides, fourteen fresh water reservoirs were built in the Akmolinsk, Pétropavlosk and Ichim districts.

A few of our frontier countries, such as Turkestan and the Transcaucasus are of a very special character. They possess, it is true, important streams fed by the waters from the everlasting snows which cover high mountains; but from very ancient times, these countries have only had a very insufficient native irrigation.

The climate there is exclusively warm and the soil might be made very fertile and fit for the high cultivation of cotton, rice and the vine, provided that a well comprehended system of irrigation were laid out.

Examinations, followed by projects, were made over large uncultivated tracts belonging to the Crown, with the intention of organizing there a regular system of irrigation, founded on the principles of contemporary technical knowledge.

These works were begun by the construction, in Turkestan, of an irrigating canal for watering a tract of 50,000 hectares (= 123,000 acres) in the Faim steppe (Golodny).

Works of the same sort are under construction in the Mongan steppe, in the Transcaucasus, in the basins of the Koura and the Araks, near the Persian frontier.

All the agricultural hydrotechnic works just mentioned, and the result they have given showed their utility and incited the population to undertake similar works on their own territories.

We are already witnesses of the united efforts of the State, the zemstvos and private owners working together on a larger scale for agricultural improvement.

In fact, the public hydrotechnic works carried on in the Toula government, after the famine of 1905, are a proof of what has just been said.

With the resources at the disposal of the zemstvos and the local population, in connection with assistance and plant from the State, many water supply works were put in, during two years, at 800 points of this region, by means of wells and ponds.

From Toula the works passed over into the Voroniza government.

It would be necessary now to take up drainage works for the great marshes of the Northern region.

In order to understand fully the agricultural hydraulic works of the vast Russian Empire, it is absolutely necessary to give the widest possible extent to hydrometric, hypsometric and geologic studies and to apply them to the most important river basins.

All the data gathered along these lines can be used as auxiliary to other close researches carried on for the needs of navigation.

It is clear from all this that the mutual collaboration of the engineers of navigation and agricultural hydraulics is necessary, indispensable even, in order that the undertakings conceived and carried out for the utilisation of water may be useful for the prosperity of the country.

Being, as we are at the present moment, on the eve of realizing in Russia hydrotechnic improvement works on a large scale, agricultural hydraulics has been invited to take part in a Congress of Navigation.

I cannot tell you how happy I am over this event which allows us to profit by the assistance of the eminent specialists of the civilized world who have come to St. Petersburg to take part in the works of the XIth. Congress.

It is a real pleasure for me to express the hope that our collected efforts may be crowned with fertile results and, penetrated by this conviction, I declare the session open.

The examination of the fourth question : —

Canals which serve both for Navigation and Irrigation

will now be taken up, and it will be followed at once by the fifth question : —

Protection of low-lying lands against invasion by water.

This speech is received with applause by the whole assembly.

THE PRESIDENT. — Mr. Rytel, General Reporter for the fourth question of our programme, has the floor.

THE GENERAL REPORTER reads his report. After ending his statement, he gives it as his opinion that it would be better to reserve the conclusions and to continue the study of the question until the next Congress, in order to bring into the discussion new and necessary elements.

THE PRESIDENT. — Mr. de Bovet has the floor.

MR. DE BOVET. — I ask to be allowed to submit a few reflections suggested by reading the reports relating to the matter which is coming under discussion.

This is, first and foremost, a Congress of Navigation, consequently the question which should be put first is this : can a canal intended for navigation be used also, without inconvenience, for other purposes ? These latter can only be, evidently, either irrigation or the creation of motive power and hence the question stated comes back to this : can it be admitted that a canal intended for navigation may be traversed by running water instead of being filled by water which is nearly stagnant.

For my part, I consider that there should be no hesitation in answering affirmatively, provided that the velocity of the current be suitably limited in proportion to the cross section of the canal. The first thing to be done is, then, to set this limit ; for this, we have only to appeal to experience acquired on various streams, as such a canal may be assimilated to a regulated river, and I think that a velocity of as much as 0.60 m. per second may be allowed on canals of a very large cross-section,

that is to say, sensibly greater than the figures given in several reports.

This current will be an obstruction to boats going one way ; it will help those going the other. It is needless to say that existing canals, to which it is no longer possible to give the necessary slope, cannot be considered here and that it can only be a question of canals to be built in the future. As to these, every one is agreed, I believe, that it is to the interest of navigation to make them with as long levels as possible, and to make the successive steps, become fewer in number, higher than has been the practice heretofore. It is not necessary, in order to reach this result, to resort to systems which have not yet come into general use, because I do not think that it is excessive to look forward to lifts of 10 to 12 metres, and more perhaps, for locks.

If there be no lack of water, these locks will be built of such size that they can take in several boats at a time, so that it will be possible to draw the latter in trains of which the make up will be limited only by the capacity of the locks, and, consequently, there will be obtained an economy over individual traction which last is hard to avoid when the boats have to pass one at a time through the locks.

If the discharge be at all important, given the small velocity considered, the section of the canal will be very much increased as compared with that of present canals, whence there will be an advantage for boats going down stream and an attenuation of the excess of effort which the existence of the current requires from boats going up stream.

All the towing will be done, naturally, by mechanical means and no longer by horses. Tugs may suffice, as they are perfectly capable of overcoming, at no too great cost, a current of 0.60 m. If it be to be feared that the work required of them in going up stream be still such as to risk the preservation of the banks, it would be otherwise going down stream. Hence, taking the great length of the levels into account, we may look forward to hauling tugs pulling by a chain their trains going up stream, for which the existence of so feeble a current might be neglected, under these conditions, while their run would be free going down stream. It is needless to say that tractors on the bank could also be used as they have been already well tested. In either case, the power necessary to put these appar-

atus in motion would be furnished by the power stations at each lock.

I think that it may be concluded from what precedes that navigation can accommodate itself perfectly and without inconvenience to a running water canal.

If the water thus discharged is intended for irrigation, one condition forces itself on the attention : the canal must lie above the lands to be irrigated. Now, the line of a canal intended for navigation is determined by commercial considerations, which may frequently not be in accord with the above condition, and which, evidently, cannot be subordinated to it. Such a canal will be capable, therefore, of giving to agriculture all the water desired within the limits of the water supply, but local conditions may be such that only a small part of the surface to be reached can receive the water directly from the canal. Will the surplus be inaccessible? I think not.

As I have said already : there will surely be at each lock a motive power plant which will be more important as the discharge is greater, more easily organized as the fall is greater, which, as is well known, agrees with the demands of navigation. It will be easy, with the power so obtained and by selecting suitable points, to set up electrically driven pumps which will raise the water to the proper level either from a bleeder of the canal, brought by the shortest line to the pump, or from rivers in the neighborhood.

Many previous studies have shown that the length of the trunks which have to be constructed to bring water for irrigation at a high level into a valley, costs out of all proportion with the price at which the water can be sold. That being the case, the idea has arisen, in certain cases, to replace the long trunks by steam pumping engines. This was still too costly, but I am not alone in thinking that it might be otherwise with electric engines and an organization like that to which I have alluded and in favor of which the advantage can be claimed of reducing to a minimum the circulation of the water and the consequent losses.

Treating the question as I have done from a wholly general standpoint, it is difficult to introduce figures. It seems possible, however, to justify my conclusion. The power plants at each lock will be so many central stations which can sell current all around them: great navigable canals, were it only by the very

fact of their existence, run through industrial regions where the sale of the current will be easy whatever may be the disposable quantity, this being limited only by the discharge of the canal, and consequently, under the hypothesis adopted, by the possibility of water supply. If this last be sufficiently abundant, there will certainly be energy disposable for sale, even after having counted out, first the water used directly for irrigation, then the work absorbed by the indirect irrigation of which I have just spoken. It may even be considered likely that this last work may be called for from the machines at times outside of those when they will have to meet other industrial needs and hence, that it may be estimated at a sufficiently low price to have the cost of the cubic metre of water raised much less than by either of the other methods which could have been considered formerly.

It is clear that a canal built in accordance with the programme which I have just stated will cost more than a canal for navigation along the same line, with dead water, in the ordinary way. Still, if we consider not its absolute price, but the extra cost over what would be spent for this latter canal, we must consider at the same time the additional income arising from the sale of electric energy to the industries of the neighborhood and the sale of water to agriculture. It is likely that this additional income will more than cover the increase in the cost of construction. If this be so, its result can only be to make easier the construction of the canal.

May I be allowed to take an example and, following Mr. Levy Salvador, select the valley of the Rhone, from Lyons to Arles, about which he has given some details. It seems to me little doubtful that, at some more or less distant day, a canal will have to be built alongside of the river. Before any works whatever shall have been begun, new boards will have followed the one whose conclusions are quoted by Mr. Levy Salvador. I should be much surprised if they sustained this statement that any solution involving a mixed canal should be set aside and I consider it probable that they will end by saying just the reverse. Without any pretension, which would be at least singularly premature, to define how this canal should be built, I think that I may consider it likely that its slope and its discharge will not be the same throughout its length : nevertheless it may be regarded as equivalent to a uniform canal of a con-

stant discharge of, let us say if you like, 100 cubic metres as this figure is but a small part of the minimum discharge of the river at Lyons.

A canal for navigation only, which should be able to carry boats of 600 tons, should have, beyond doubt, a bottom width of about 20 metres, corresponding to a draught of 2.50 m. and to a wetted section of, probably, 60 square metres. In order to discharge 100 cubic metres a second with a velocity of 0.60 m., a section of 170 square metres will be required. As there is no obligation to obtain this increase of section uniformly and everywhere, there is no proportionality to be established between the increase of section and the increase of cost. Furthermore, taking into account the average to be given to the work, there is for the whole length a total fall of 130 metres, corresponding to a possible power of 130 million kilogrammetres (= 94 million foot pounds nearly), or sensibly 132,000 kilowatts. Given the possible multiplicity of applications, there is, I think, nothing excessive in assuming a utilization of 5000 hours, whence, starting at the very low figure of 3 centimes (= \$0.006) there may be anticipated a revenue of 20 millions of francs in round figures. Leaving aside the increased value of the irrigated ground, it really seems as though there were plenty of resources to cover more than the difference between the costs of establishing the one or the other canal.

Let it be said in passing, that considerations of the same order will come to mind the day when the decision is reached to make a lateral canal so as to overcome the rapids of the Dnieper.

I shall not go further, because the objection might be made that, after all, it is not necessary to argue so much to show that the more completely a work is utilized, the more numerous will be its direct or indirect sources of income and the more easy should be its construction.

If the views I have just put forth be exact, there is no reason, within the limits of the disposable water supply, why the discharge of a canal should be confined to the mere sale of water and electrical energy. The available water supply for a lateral canal is generally very large; it might be very restricted for canals with a summit level, and even nothing at all when the supply of a canal for navigation has to be given artificially, in which case the question of a mixed canal would not even be proposed. It must also be further remarked that, when it is a

question not of pumping up the water supply with a steam engine, but of taking it from springs or of accumulating it, the fact that additional revenues can be obtained therefrom is of a sort to allow of making the necessary works more important and hence more effective. Then too there is nothing to hinder the discharge of a canal being increased as it goes down the valley and there meets new possible sources of supply. And finally, if the canal, near the end of its course, crosses low countries which it may be worth while to drain, it can furnish the motive power needed for pumping and an outlet for the waters raised.

If now, instead of a canal for navigation, a canal constructed especially for irrigation be considered, should it be organized so that it can subserve both ends? If the case be considered, as mentioned in the reports, of an irrigation canal being substituted for an arm of a navigable river, it will rarely happen that it cannot be made navigable and there is no doubt that it will be advantageous to make it so.

If it should be a question of canals to be laid out in the lower parts of a valley, their water supply will be as easy as in the case of a lateral canal; access to them will generally be convenient all along their extent wherever the points of discharge by the way have not reduced too much the depth of water; they will lend themselves at least to local transportation of which the importance will depend upon the way in which these canals may be connected either with important centres of consumption or with the rest of the navigable system.

Were it a question finally of canals to be constructed in the upper parts of a valley, it is then the trunk which brings in the water, and it may be sometimes very long, that can be arranged to carry boats, under the same reserve as above, but then a solution would be adopted there similar to the one I mentioned before: the suppression of the trunk solves the question.

It seems then that it can be said briefly: —

« In so far as concerns canals to be built especially for irrigation, it will be a question of kind to see whether there be any object in so arranging them that they can carry boats if that were not their original intention, but if the line they are to follow involves falls of some importance, they can be used both for watering and at the same time for producing motive power and to this extent they will still be mixed canals.

» In so far as concerns canals for navigation, the existence of a slight current should not be considered as an obstacle to navigation, and wherever there is a sufficient water supply, it is well to utilize these canals as completely as possible and to construct them under the form of mixed canals which can be used at once for navigation and for the production of motive power. »

In this way a quite precious material will be turned to the best advantage, provided that none of the uses to which it can be applied be neglected and especially among these that in which no other can take its place, I mean irrigation.

THE PRESIDENT. — Major Cosby has the floor.

MAJOR COSBY (in English). -- With the rapidly increasing popular interest which has developed during the last few years in the United States in favor of the more extensive improvement of our rivers and canals, there has grown recently a feeling that in planning works for the purpose of improving navigation, greater consideration should be given in some cases to other possible uses of the waterways, such as the development of power and the drainage or irrigation of adjacent lands. It is with these last uses that the present question is concerned, and I have been greatly interested in hearing of the experience of other nations in their attempts to provide, in one canal, for the conflicting functions of navigation and irrigation.

It is noteworthy that all five of the reports submitted confine their attention almost exclusively to canals used for the combined purposes of navigation and irrigation; very little is said about those used for drainage. In fact, all five of the printed reports which were sent to me bear on the title page the word « irrigation » instead of « agriculture », so it is possible that the scope of the question may have been broadened after some of the reports were written and this may explain why it is that the canals in Holland and Russia mentioned by the General Reporter, Mr. Rytel, as being used for both navigation and drainage are not discussed in any of the reports.

As far as can be gathered from the few instances cited, it appears that, in these cases, drainage canals have been used successfully, to a limited extent at least, for purposes of navigation. The one Italian canal of the combined type which may

be said to be really satisfactory in operation, the Volano, was constructed primarily to serve as a drain, and its use for irrigation purposes is apparently small and unimportant.

When we examine the various attempts which have been made on a large scale to utilize canals both for irrigation and navigation, very different results are seen.

As stated by Mr. Vendell, there have been few such attempts in the United States, and those have been of an unimportant character. He also puts clearly some of the principal objections and disadvantages which will usually be met with in endeavoring to use a canal for both the purposes under consideration. In addition to those which he mentions, difficulty has also been found in practice in regulating the velocity of the water so as not to impede upstream navigation and erode the banks on the one hand and on the other so as to furnish an ample supply for irrigating purposes when and as needed.

It is quite evident, from a merely theoretical consideration of the subject, that the difficulties to be met are so numerous that in only a few peculiarly favored localities will it be possible to combine advantageously, in one canal, the two functions of navigation and irrigation. There are three countries in which the natural conditions are such that attempts on a somewhat large scale have been made to solve the problem, viz. Italy, India and Egypt. In the first named country, some half a dozen canals are actually used for both purposes, but, omitting the Volano, all are short and the boats using them are small, and the total annual commerce carried by them all is not very great. It is quite clear, from the reports, that in nearly every case difficulty is constantly experienced in reconciling the conditions necessary for the successful operation of each of the two functions which usually conflict, the result is a compromise, certainly not very satisfactory in most instances, and it is probable that, if either the amount of navigation or the extent of land to be irrigated were sufficient to justify the expense, the difficulties actually encountered would be met by constructing separate canals for each purpose.

It is stated, that in India, the irrigating canals are little used for navigation in comparison with the expense incurred to facilitate navigation, and the disadvantages of attempting to combine the two functions in one and the same canal bed have been found to be so great that Indian engineers are quoted as

being, in recent years, opposed to making irrigation canals navigable, and recourse has already been had in some cases to building parallel canals for irrigation and navigation respectively.

This leaves Egypt as the one country in which these two uses may be said to be combined successfully, owing to the peculiar local conditions, and even there, some difficulties, such as excessive silting, have to be contended with, and the growth of the railways is lessening the use of the canals for transportation purposes.

In conclusion, I think it has been well shown that the advantages to be obtained by adopting the combined system only outweigh the disadvantages in localities where the conditions are exceptional, as in Egypt, and that generally it will be found to be in the interest of both ultimate efficiency and economy to solve separately each of the problems involved.

There will be found to exist in most regions of the temperate zone the same conditions as those which are described in France by Mr. Lévy-Salvador who emphasizes the fact that irrigation is there only a secondary consideration which must not be allowed to interfere with the paramount interests of navigation.

At least, it would seem advisable for the Congress to recognize more clearly in its conclusions the difficulties of the problem presented, upon which all the authors are agreed and it is suggested that the second conclusion be modified by omitting the word « irrigation » from its present position and by adding :

« But it is only under the most favorable conditions, such as »
» those which exist in the delta region of Egypt, that canals »
» used on a large scale both for navigation and irrigation have »
» given satisfactory results and can be called really successful. »

THE PRESIDENT. — Mr. de Joly has the floor.

MR. DE JOLY. — In order to show that it is not impossible to use the water from navigation canals for agricultural purposes, Mr. Lévy-Salvador calls up the examples of the canal du Midi and of the lateral canal of the Garonne.

Having been placed in charge of the direction of the services of these canals, by the Minister of Public Works, I must make some reservations as to the statement and conclusions of my

esteemed compatriot Mr. de Bovet, who takes the stand, naturally, of the Department of Agriculture.

As a matter of fact, the canal du Midi is scarcely used at all now for the winter submersion of the vines in Lower Languedoc since the substitution of American plants for the old French plants, destroyed by the phylloxera. It was to save these latter that the measures mentioned in Mr. Lévy-Salvador's report were adopted from 1878 to 1881. But the winter submersions have been followed by summer watering, which it was not believed possible to refuse to the syndicates formed for submersions and which are incomparably more dangerous for navigation, because they coincide with times of penury in the water supply; not that the zone of the canal du Midi where the water is taken is supplied, as Mr. Lévy-Salvador believes, from the summit level; the latter would surely not suffice for this; the water theoretically necessary for watering in summer, as practised by the submersion syndicates, is the object of a special draught on the river Aude. But the use of watering-taps gives rise to abuses of every kind in dry weather and although most of them exist in a level 53 kilometres long, in which the surface of the water is then raised by 0.10 m. (= 4 inches) above the normal level required for navigation, sudden and furious drops are caused frequently, to the great detriment of navigation.

On the other hand, the introduction into the canal of water carried therein for the exclusive interest of watering vines is accompanied by important deposits of silt which require extra dredging at a cost of not less than 45 francs per litre-second.

Finally it is an illusion to believe that water for watering carried by a navigation canal does not react unfavourably on the cost of traction borne by the boating industry. Mr. Lévy-Salvador quotes, in this connection, the lateral canal of the Garonne, which carries, for agricultural or industrial uses, a volume of water far above what is needed for navigation (6,837 litres instead of 2,046 litres in the Toulouse branch. Now, the resulting increase of velocity (1), an increase of 0.14 m. per second of the regular line, raises unanimous protests from the boating industry, and the Public Works Administration is occupied in

(1) The velocity is about 0.21 m. in the regular line. It reaches 0.30 m. to 0.40 m. at narrow passages and exceeds 0.70 m. on the Robine de Narbonne, a branch of the canal du Midi.

doing them justice by reducing the discharge of the water supply so far as present conditions allow.

In conclusion, the navigation of the canal du Midi and of the lateral canal of the Garonne suffers greatly from the three evils which follow from their mixed character : —

Increase of velocity due to oversupply of the levels ;

Sudden drops of the surface of the levels due to watering ;

Silting up of the ditch of oversupplied levels ;

and their example cannot be quoted in support of the thesis of mixed canals.

I shall mention also that, from 1858 to 1898, the canal du Midi and the lateral canal of the Garonne were farmed out or granted to the Southern Railway Company which had an immediate interest in developing the agricultural or industrial uses of the water of the canals, as it developed in this way the quantity of the products to be carried on its tracks while rendering still more difficult the already much reduced competition of the boating industry. The very natural tendency of the Southern Railway Company was to develop submersion and irrigation in Lower Languedoc as they are there truly of great importance (1) ; but it is evident that the primary interests of navigation, to adopt Mr. Lévy-Salvador's expression, have suffered greatly and probably will continue always to suffer from them.

THE PRESIDENT. — Mr. Sanjust di Teulada has the floor.

Mr. SANJUST DE TEULADA. — I have asked for the floor in order to back up the observations of Engineer de Joly on the incompatibility which appears sometimes between navigation and agricultural applications on mixed canals. We have been obliged at Milan to set a special time table for the *Fossa interna*, on which the morning is given to navigation and the afternoon to other uses. On the *Naviglio di Pavia*, although the regulations give the first place to navigation, there are constant

(1) 7,700 hectares (1 hectare = 2 1/2 acres) watered at an estimated annual profit of 300 francs per hectare, or, in all, 2,310,000 francs; 1,300 hectares submerged at an estimated annual profit of 180 francs the hectare = 234,000 fr., a total of more than 2,500,000 francs of profit per year.

conflicts between the boatmen and the users of motive power. The same trouble is noticed on the *Naviglio Grande* and on the Bereguardo and Martegana canals.

I insist therefore on my conclusions and beg the General Reporter to take them into consideration. If, for my part, I admit that it is well to arrange new agricultural canals so that they can be used for navigation, I think that a great navigable canal, with a heavy traffic, cannot meet other ends without more or less serious troubles being the result.

THE PRESIDENT. — Mr. de la Brosse has the floor.

MR. DE LA BROSSE. — It seems to me that, up to the preceding speaker, there has not been laid the stress there should be on the possibility of satisfying agricultural interests in the study of the conditions for laying out canals intended mainly for navigation.

To be sure, the General Reporter does say (p. 16) that it follows from these examples that, *in making the studies for a canal intended for agricultural improvements, the facility with which it can be converted to use also as a navigable highway should never be lost to sight*, but he does not mention the reciprocal, viz. : that in studying out a canal for navigation, it is well also to keep in view the facility with which this latter can be arranged to satisfy the agricultural interests of the adjoining regions.

Now, this facility seems as though it should be noticed in many cases, especially when it is a question not of using for this purpose a canal already in existence, but of constructing an entirely new canal for navigation as it has been a question for a long time of doing in France in the valley of the Rhone.

The type of mixed canal considered up to the present time has been above all, it might even be said exclusively, that of a canal in which the water comes by the canal itself to the heads of the irrigating feeders or of the secondary branches of distribution.

Now, the Reporters have brought out, justly, the opposite conditions which have to be sought on the one hand for navigation (closeness of thalwegs together, least velocity of current, constancy of levels and regimens) and, on the other hand, for irrigation (great extent of surface controlled, large discharge with a velocity which is embarrassing for boats, variations of agricultural needs according to seasons, etc.). These two clas-

ses of requirements are certainly diametrically opposed to each other and it is often difficult to reconcile them, not always however, as the reports point out an appreciable number of happy solutions in India, Egypt, on the plain of Lombardy, in Russia and even in France (canal de la Sauldre).

But the reconciliation seems much easier provided that, instead of the type of mixed canal which carries water for irrigation and which is to provide along its course the means of escape to moisten the ground, the mixed canal could be considered which bears the energy which will pump water from outside of its own right of way either from the bed which occupies the thalweg, or from subterranean sheets of water, or again from adjacent valleys by means of the facilities which the transportation of energy to a distance now offers.

With the mixed canal thus understood, the consideration of the area dominated by the line disappears, that of the variation of agricultural necessities loses some of its weight and most of the difficulties are reduced.

Navigation seeks the concentration of changes of level at a minimum number of points with a maximum lift, this is just what suits a good utilization of energy the concentration of which favors efficiency.

It is true that the objection of velocity still exists, as a discharge is required to produce energy and any discharge presupposes a current ; but if the difficulty does not disappear altogether, at least it is reduced because, on the one hand, there is less water to be carried in the canal and because, on the other hand, the energy set loose at the fall supplies just the means for overcoming by means of proper machinery the resistance of this velocity to the movement of the boats in one direction.

If my memory serves me rightly, the means used on the Erie canal overcome currents of 1.25 m. (= 4.10 ft.) and even of 1.50 m. (=4.90 ft.). All the more would the same means be effective if they were confined to limits of velocity given in the last conclusion of the printed report (0.75 m.=2.50 ft.).

Opinions may differ as to figures, what must the remembered is that the canal of the future will, doubtless, soon cease to have towing or animal motors as its main engine and that traction will use more and more the mechanical means which the energy of the lifts brings within its reach.

Then the objection of velocity will lose much of its value as the remedy is alongside of the disease.

Finally, it is well to consider that in the case to which I allude, that of the Rhone canals of which the cross section will be, undoubtedly, of 60 square mètres (= 646 sq. ft.), a slope of 1 : 10,000 would produce a current of 0.70 m. and a discharge of 40 cubic metres (= 1400 cu. ft.).

The velocity of 0.70 m. would certainly not be excessive with mechanical means of traction and this difficulty would be largely made up by the power obtained which, for a total head of 100 metres (= 330 ft.) would supply 40,000 H.P.

It is conceivable that two parts be made of this power, one reserved for traction machinery, the other also large (and undoubtedly uniting nearly the whole at certain hours of the night) devoted to pumping the river water which would do so much to fertilize 30,000 to 40,000 hectares (= 75,000 to 100,000 acres) of the many crops of Provence.

It would seem then that the conception of the mixed canal should be broadened and attached to the utilization of the energy which can remove nearly all difficulties.

This is why it seems desirable that the study of this interesting question be laid over the future congresses.

THE PRESIDENT. — Mr. Audiffred has the floor.

MR. AUDIFFRED. — The observation which I desire to make to the section is of an economic order.

All the speakers whose learning and high position authorized them to address the Congress at its opening session, have proclaimed the necessity for developing inland navigable highways in the interest of agriculture and industry with the object of insuring more ease for the people.

If it be easy to build canals and improve streams in flat countries like Belgium, Germany and Russia, where technical difficulties are few and the costs very small, the construction of these lines encounters, on the contrary, both technical and financial obstacles which have been, so far, insurmountable in countries where a large amount of the soil is broken, as in France, Italy, Switzerland and Austria.

The three following examples are proof of this fact.

The construction of a canal with locks in the upper part of the valley of the Rhone, between Lyons and Geneva is nearly impossible. That of the canal joining the Rhone with the Loire, through a country where the altitude varies between 270 and 530 metres and between 530 and 150 ; that of the canal joining the Danube and the Oder, where identically the same differences of level are met, must also be considered as out of the question, technically and financially, with the means in use up to the present time.

Engineers who have studied the Rhone-Loire canal foresee quite a number of levels of 500 metres at most, with many storage basins made necessary by their heavy tonnage, as circulation there is impossible. The cost is estimated at 120 million francs for a length of 130 kilometres. It can be said, under these circumstances, that the work is not to be considered although theoretically it is possible. The countries in which such enterprises come up, are not in position, with the resources given by taxation, to carry such crushing burdens. It is necessary, therefore, if these works are to be carried out, to find alongside and outside of the tax rates, additional resources to lighten what has to be asked for from the inhabitants of the land, and to devise combinations which will have the double advantage of raising an important part of the necessary funds and of giving to agriculture and industry special and very appreciable facilities.

Mixed canals, provided that they do not compromise navigation in any way, offer one of these solutions, hence they should be studied. I agree with the preceding speakers on this point, but I did not ask for the floor to support their contention.

The utilization of high falls of water and the transportation to great distances, by means of electricity, of the power produced give another means of obtaining pecuniary resources and so make easy the construction of canals just at those points where the accidents of the ground seem to be absolutely opposed to their being carried out.

Engineers of the highest worth : Mr. Blondel, Professor at the School of the Ponts et Chaussées at Paris, Messrs. Houle and Mohr have proposed to build, with a view to collecting the hydraulic force of the Rhone, in the department of the Ain a dam 70 metres (= 230 feet) in height, with a hydro-elec-

tric station at the foot to supply the city of Paris with a large power.

The cost of the project estimated at 60 millions, will be covered by the income from the distribution of power to large and small industrial establishments as well as home shops. The 70 metre dam will form below Geneva a pond 23 kilometres (= 14.30 miles) long, navigable everywhere, which will be given gratuitously to the French State. The holders of the concession will build at their own cost at the foot of the dam a very strong lift which will raise 600-ton boats in a few minutes to the top of the pond. It will cost 4 millions. This is a solution which will allow the State to acquire, without loosening its purse strings, a navigable highway of 23 kilometres, destined to be prolonged, by way of lakes Geneva and Neufchatel and the valley of the Ahr, to Lake Constance. It is assuredly of the highest interest.

But here objections arise. There are engineers who maintain that lifts are not absolutely safe, that any machinery may deteriorate, that an accident like the one which happened to the Fontinettes lift might cause quite a long interruption to navigation.

The answer might be made to this is, that one way of avoiding such troubles would be to have two lifts instead of one. Then, everything is perfected, mechanical invention is only at its beginnings. The very ingenious and already very practical automobile is not a very robust carriage, suited to every kind of public service. Who dares to say however that it will not ere long realize all desiderata?

My conclusion is that this is a question to be studied. It has taken up the attention of preceding Congresses, it is important that it remain on the order of business until a satisfactory solution have been reached.

THE PRESIDENT. — Doctor Papillon has the floor.

Dr. PAPILLON. — Three contemporary scientific discoveries invite us to modify the old formula for building canals for navigation. Two of them show the possibility of doing this; they spring from the science of the engineer. The first is the strength of materials, as much in the composition of steels as

in the use of reinforced concrete. The second is found in polyphase electric currents.

The third indicates the necessity for doing it. It relates to the cultivation of the soil, the original source of all industry and of all commerce ; it is the intensive cultivation by fertilizers. It needs irrigation.

These two seem to be diverging interests. They can be reconciled in most cases — at least to a certain extent. It is a question, then, of mixed canals to be used both for navigation and irrigation. I shall say nothing about drainage canals. In ancient times, the Romans built them at the gates of Rome, in the Pontine Marshes ; to-day, Russia, under the direction of General Jilinski, is laying them down resolutely and with success.

I have pointed out this new formula for the construction of canals in my preliminary project for a canal from Nantes to Bâle, a canal which, crossing France, would place Bâle in communication with Nantes-Saint-Nazaire, and thence with the Panama Canal and the two Americas, with a trip shortened by three days and a saving of 30 francs per ton. Then, in the other direction, by way of the upper Rhine, with Lake Constance, which will become the central port of Europe, the line will reach the Danube and thence all the inland navigation of Europe and the Black Sea.

I propose only 9 locks in this preliminary project for a distance of 357 kilometres, or 8 levels one of which will be 122 kilometres long, and here in few words is the whole method : a canal on the crest and not in the valley.

a) Few locks and high lifts : 10 to 12 metres. The Villetre canal at Paris has one of 10 metres ;

b) Quickness and regularity of transit ;

c) Economy in operating costs ;

d) Facility of crossing rivers, by means of canal-bridges, and of passing through cities ; and here I invite the attention of the members of the Congress. With high lifts, the lock can be placed, in crossing a river, on either the right or left bank, and for a city, it may be placed above or below.

Locating the lock before crossing the river, every latitude is left for constructing a canal-bridge ; and, if the lock be placed above the city, the passage through can be carried under the

public highway, with metallic decks over head, as was done with the Metropolitan (subway) in Paris.

Here then are two great obstacles, very simply removed :

c) A small amount of water taken at the locks drives a turbine which produces an electro-motive force for towing, lighting at night and handling the lock gates.

I must say here at once that such a canal will cost a little more on account of the height of the banks and the greater pressure of the water ; whence greater possibilities of leakage and the necessity of a concrete lining for the ditch in certain kinds of ground. But if the cost be in absolute figures a little greater, relatively it will be less so : small number of hands as there will be no locks, and in addition to tolls, the canal will collect other revenues : sale of water for irrigation, and sale of electric energy to towns or factories.

This canal will have a slight slope to allow for evaporation, leakage and water drawn off. I propose, in my preliminary project, that the slopes shall be of $1/2$ to $3/4$ or even 1 millimetre per metre, according to the soil and the section of the canal. The mean slope will be about 70 centimetres per kilometre or $7/10,000$. I lay before the meeting a certain number of copies explaining my ideas and giving the plan and longitudinal section of the canal which will be a canal of the present — as a part of already existing canals will be used — but which, in the new parts to be built, it will be prudent to lay down as a canal of the future able to carry boats of 500 to 600 tons.

I shall add but one word, it is that, contrary to what a French state engineer said day before yesterday, there is in these new style canals an industrial side which would only give inferior or bad results in the hands of the State. Such canals should be granted to corporations or corporative societies, Chambers of commerce, as in France the St. Quentin canal, as in Belgium intercommunal railways, or to the district, as the Teltow canal. These corporations watch their interests closely and, for lack of corporations, the concession could be granted to societies. Let the State, in France, watch and control, but let it neither construct nor direct, because — economically — it is as bad an operator as it is a bad administrator.

THE PRESIDENT. — Mr. Dabat has the floor.

Mr. DABAT. — Mr. de Joly does not consider the example taken from the canal du Midi as conclusive. It must be remembered, however, that it was used for submersions for many years. Mr. Lévy-Salvador's data are found in the reports of the engineers. What I can state for the lateral canal to the Garonne is that Mr. Volontant offered us water for irrigation, hence there is no great trouble for navigation. But I shall not dwell on these divergences as they are unimportant.

Mr. de Bovet has restricted the problem, at least in the beginning of his remarks. He thinks that the arrangement of a canal for navigation with a view toward irrigation is the only question to be studied. No ; the drainage canal which can be used also for navigation must be considered. This is a mere remark, for I am wholly in accord with the conclusions of his report.

It is well understood that irrigation by means of a navigation canal is asked for only as an accessory.

Special conditions must be had for a complete mixed service, as the General Reporter, Mr. Rytel, has shown. It is very evident that canals which drain marshes and have sufficiently large cross sections, must be utilized necessarily for carrying the products of the marshes. These canals are true water ways.

Holland, France and nearly every country can give examples of this sort.

Irrigation, in connection with navigation canals, can only be an accessory. This is admitted.

What we ask is : —

1. That, in laying out the line, attention shall be paid to the agricultural groups to be served and not only to the industrial and commercial ;

2. That, in studying the question, the possibility of satisfying irrigation must be sought : —

A. — By increasing the quantity of water carried : —

1. In order to be able to irrigate the low lying cross parts, and
2. In order to pump for high grounds ;

B. — By creating falls, in order to produce the electricity necessary for pumping (for traction, for lighting).

The interests of navigation and agriculture are often the same (for example : canal du Midi) ; both need water.

Agriculture studies the construction of dams among the mountains or at least in the high parts of the valleys, or unnavigable streams, concordantly with industry, which will utilize the falls created to insure water in the rivers and canals in time of drought.

Agriculture is all ready to give up water to supply canals for navigation if agricultural watering be taken into consideration.

The costs will be divided properly.

The agricultural hydraulic service pays all the more attention to dams as they give a reserve of water and power at the same time. Power acts to obtain water in the lower parts of the valley where it would be too difficult to bring it by gravity. Hence suppression of the trunks.

Conclusion. — Agriculture must not be regarded as a quantity to be neglected. It is one of the important sources of richness in all countries, but especially so in France. It is agriculture which keeps industry alive, it furnishes the principal raw materials. Commerce is mainly supplied by products of the soil (cloths, wools, etc.). Countries which neglect agriculture for pure industry are always threatened with economic crises. Agriculture is a valuable counterpoise ; but if agriculture is to live, it must have water.

In order to give water to agriculture, navigation and industry should be its allies and each one will find its profit. One part will be, the assistance of money to build canals, to bring in water, and facilities for creating industrial dams.

It is a most interesting question. The use of forces created by waterfalls opens a new line which must be studied, and the study is not yet ended ; it is merely sketched out and it must be continued.

THE PRESIDENT. — Mr. Flamant has the floor.

Mr. FLAMANT. — It follows from all that has been said that the question has not been completely studied. We have heard of the difficulties between navigation and the direction of canals. What are these difficulties ? Some are administrative and others are technical. They must be studied in each special case ; it is a question of kind.

Mixed canals do exist and others will be built. The legislative, administrative and technical precautions for avoiding or lessening the disadvantages of the system must be known, hence the question should be kept on the order of business.

Conditions vary greatly in different countries. Now, the Congress is international and must take up whatever interests the engineers of all countries. The engineers of the North, where canals are specialized, have very clearly defined opinions, but those of the South hold very different ideas. The former tend to set aside the conception of mixed canals which we defend. The existing mixed canals in Russia, India and the United States cause difficulties against which we should react.

I ask that the study of these questions be kept on the programme of the next Congress and with a greater precision than has existed up to now. Mixed canals are a special, but very frequent, case of canals for navigation. A useful work will have been done by stating clearly the difficulties which they offer in practice and by demanding the remedies therefor.

Hence I offer the following proposition : —

The study of the questions regarding mixed canals has not yet been examined with sufficient thoroughness, considering especially the new ideas which have come out in the discussion which has just taken place. It should be kept on the programme of future Congresses.

Mr. GERARD. — I take the liberty of asking the meeting for the reasons which caused the General Reporter to abandon his conclusions.

Mr. DE BOVET. — The reasons must be sought in the fact that he was convinced by the remarks of the speakers.

Mr. GERARD. — It is to be regretted that the deliberations have to be on vague conclusions ; I consider that, in the present instance, there is no need to abandon the conclusions of the general report.

Mr. DE BOVET. — I cannot share Mr. Gerard's opinion. It is not correct to say that the conclusions are vague. It should be

remembered, furthermore, that it is the custom of the Congresses not to give out too precise expressions of opinion.

Mr. FLAMANT. — I hold to the conclusions which I expressed by reason of the new ideas put forth during this discussion and of which the General Reporter had no knowledge when his report was prepared.

THE PRESIDENT. — The vote will now be taken on the conclusions.

Mr. GERARD. — I move that the vote be taken first on the conclusions of the General Reporter.

THE GENERAL REPORTER. — With a very slight difference, Mr. Flamant's conclusion is the same as mine. The words : « and of industry » can be added to the text of the first conclusion.

As to the text of the third conclusion, I must mention to you that I have received from Mr. Sanjust di Teulada, Reporter, a letter in which he informs me that he does not share the opinion of Mr. Cucchini his fellow reporter.

Mr. CHARGUÉRAUD. — It is very simple to bring every one into accord. We have merely to adopt the conclusions of the General Reporter by substituting for the 3d. paragraph the proposition of Mr. Flamant. The following modification could be made in the second conclusion : « can be used, in certain cases, for transporting ».

Mr. DE HOERSCHELMANN. — We have heard the remarks made by the different speakers. Hence we have to vote on the following conclusions : —

« 1. The establishment of a mixed canal, at once meeting the requirements of navigation and of agriculture, raises numerous local questions and therefore requires special consideration in each particular case ;

» 2. In low lands well cultivated and with a dense population, irrigation and drainage canals can be utilized in some cases for transporting agricultural produce, manure and heavy goods of bulky size and little intrinsic value :

» 3. The consideration of questions regarding mixed canals is not sufficiently investigated and ought to be retained on the programme of the next Congress. »

THE PRESIDENT. — As no one wishes to make any remarks, I declare the conclusions carried.

THE PRESIDENT. — Gentlemen, we will now take up the discussion of the fifth question, stated in these terms : —

Protection of low-lying land against invasion by water.

Here are the conclusions of the General Reporter : —

1. The efficacy of insubmersible parallel embankments for protecting low lying regions against invasion by the water of rivers is beyond doubt in certain cases ;

2. Insubmersible embankments can be made of earth and work properly if they be watched by a well organized technical service and if repairs be made at the proper moment ;

3. Defensive works will be built under the best economic conditions, by carrying them on at the same time with works for the improvement of the ground to be protected against floods ; it will be necessary, in certain cases, to resort to artificial waste weirs ;

4. Any steps taken to protect a given district from floods should be examined carefully with a view to the changes which they cause in the regimen of the river, both above and below the district. In this respect, the enterprises which form, for a given basin, a well coordinated and harmonious whole in all their parts, have an advantage over others.

Mr. MAXIMOFF. — Certain regions are particularly exposed to inundations. This is the case with St. Petersburg. The West wind drives the water to the bottom of the gulf.

Under these circumstances the only proper means for preserving the district against invasion by water consists in raising the whole area of the city.

Considering the case I have just pointed out, I propose the following conclusion : « It is necessary in certain cases to raise up all the ground that is to be protected from inundation ».

Mr. FLAMANT. — I should like to see the first conclusion modified as follows : « Lateral embankments parallel with the » river should be built with the greatest prudence ; they often » do harm in this way, that they generally increase the floods » of the upper section. »

I consider that the trouble given by these embankments quite make up, as a rule, for the advantages which they offer.

Mr. WLADIMIROFF. — An essential but little known element must be studied in connection with this question of the protection of low-lying lands against invasion by water. It is that of the formation of spongy ice at the bottom of rivers of Northern countries, and even at points along the shores of great lakes like Lake Ladoga.

These accumulations of ground or anchor ice, which science does not yet explain completely, form real dams, especially when they leave the bed and rise up in large masses against the frozen surface of the river. Their result is often floods, and injuries under this head may be estimated annually at several millions of rubles for Russia alone.

The phenomenon of the formation of a dam of spongy or granular ice was first observed by myself in 1892 on the river Svir. The submerged part of the cakes which formed the dam was soft and spongy, while the upper part had become, under the influence of a low temperature, quite hard and smooth.

Now that special researches have been made, it has been found out that broad and deep rivers, like the Neva and the St. Lawrence, are subject to the formation of dams by the accumulation of these soft and spongy masses of ground ice underneath the frozen surface. The observations made in Russia and the North of America can be generalized and it can be supposed that the winter floods of the river Terek, in the Caucasus, are due to the same causes, although the Reporter gives no details about the structure of the ice on this river.

Hence it is important when the surface freezes over to study the conditions of the bed of the river, to make sure of the presence of strata of ground ice and then to examine the structure and thickness of the surface ice, which may give unexpected results. Then, with full knowledge of all the conditions, the solution of the problem of the protection of low-lying lands

against invasion by water in winter can be sought in each special case.

The new theory of the freezing of rivers may be summed up thus : —

1. Ground ice, often containing a great deal of mud, adheres in more or less thick strata to the bottom of rivers, especially where rocks, boulders, beams, grasses, etc., are to be found ;

2. This ice does not spare lakes as some of it forms even on the bottom of Lake Ladoga. As a rule, its presence may be looked for in all masses of moving or troubled water when the temperature of the water is at freezing and the cold continues ;

3. Ground ice is so soft that an ordinary cane can be forced into it without effort. It is composed of small ordinary ice crystals, lightly connected together and forming a spongy matter of which the pores are filled with unfrozen water. Ground ice has a large volume, owing to this fact, and frequently presents a serious obstacle to the flow of water, and so contributes to raising the level of the water in the rivers where the ice is found ;

4. Certain data allow the presumption that immediately after the freezing of the upper strata of water, the ground ice, detached from the bed by the heat of the sun, rises to the frozen surface and causes sometimes regular inundations in cities as has been noticed in certain quarters of St. Petersburg ;

5. Ground ice is very sensitive to the least change of temperature. Under the effect of the sun's rays, it becomes easily detached in the shape of spongy cakes or blocks, or it rises to the surface when its volume becomes greater than the strength of its holdfasts on the bed of the river ; it is then that the ice begins to run. The formation of ground ice ceases so soon as the surface is frozen ;

6. Ground ice leaves the bed of the river with a buoyant force sufficient to raise and carry down stream anchors, iron chains, nets, large stones etc., and so make new dangers for navigation ;

7. The formation of ground ice is due to the lowering of the temperature of all the strata of water below zero to -0.01°C (31.98°F). This facilitates the junction of the very small ice crystals carried by the current or the movement of the water, as well as their adhesion to this or that object or to the bed of the river itself. The fact is that, constantly mingled together by the

force of the current, all the strata of the river have a nearly equal temperature from the bottom to the surface.

It is very admissible that, under the conditions stated, the bed of the river may be at a temperature below zero ($=32^{\circ}$ F), and that mainly as a consequence of the radiation of the heat of the ground, on clear nights, through the strata of water, and this facilitates adhesion ;

8. It is high time that the action of ground ice in seas should be investigated and studied, and above all in northern regions, beginning at small depths, preferably along shore and on bars or banks. This ice must be an essential element of ice floes and bergs of the polar regions.

Mr. MAGANZINI. — We have but just become acquainted with the conclusions of the General Reporter for the 5th. question, hence it is not possible to discuss them thoroughly. I think for my part, however, that I ought to subscribe to these conclusions, which, for that matter, are by no means absolute.

So far as Italy is concerned, I should like to give the section an idea of the system of protection of the plains against the floods of the rivers.

The question of the defence of the low plains, especially in the valleys of the Po and of the rivers of the Eastern Alps, has always been the object of important studies and works.

An article on this subject might perhaps have been interesting. But it is not the technical side alone which has to be treated. The protection of low lying regions against the overflows of rivers and secondary streams is intimately connected, in Italy, with legislation, not only for the administrative part, but also in the matter of expenses to be paid by the State, provinces, districts, syndical associations, as the case may be. Hence it would have been necessary to speak of the laws which govern this matter. Now, the legislation on hydraulic works (rivers and torrents), on the division of costs for carrying out these works, is with us in a transition stage. Hence the Italian delegation has thought best to present no article on the subject to this Congress.

The Italian Government, in order to aid local action and to act vigorously in regulating the upper basins of streams, is engaged in reforming legislation, especially in what regards the

share of the State in expenses and the assignment to its agents of the many duties now delegated to local bodies.

I should like, nevertheless, by means of a few condensed figures, to give an idea of the extent of the cost of the principal system of levees now in the hands of the State. There are in Italy nearly 6,000 kilometres of insubmersible levees bordering, on both sides, 2,980 kilometres of rivers ; 1,400 agents have charge of the care of these works under the direction of the engineers of the Corps of Civil Engineers. The area of the land protected by these works is 1,600,000 hectares (= 4,000,000 acres) with a population of 2 million souls ; they are spread over 25 provinces and 610 districts, and include within their boundaries 15 cities and 48 towns. This land, of which the present value may be estimated at 3,300 million francs (= \$637,000,000) would form but a series of marshes and barren strips were it not for the protection of the levees which have allowed them to be turned to account.

These lands are even richer and more fertile than the others of the same regions ; whereas the average land tax paid per hectare in all the 25 provinces within which levees exist is fr. 6.67, it reaches, on an average, fr. 9.10 in the territory protected by the embankments.

Besides these, there are in Italy, 4,000 kilometres (= 2,500 miles) of levees on streams of less importance under the care of local syndical associations.

I hope that these data will convince Mr. Flamant that he has been a little rash in entirely condemning the system of levees. So far as Italy is concerned, if the troubles which may sometimes arise be weighed in the balance against the advantages and improvements which the levees have given to agriculture, to hygiene, to the general prosperity and the finances of the State, an entirely different conclusion will be reached.

Mr. GERARD. — I share Mr. Maganzini's views. Holland and a part of Lower Belgium would not be in existence were it not for the dykes built in the Polders (1).

(1) Polder is a Dutch word meaning properly « land surrounded by embankments ». It is the name given in Holland and elsewhere to the low marshy regions lying along the shore of the North Sea which have been gradually drained and given over to agriculture during the XVIth. to the XIXth. centuries.

Mr. FLAMANT. — My conclusions were very hastily drawn up ; I ask permission of the meeting to make in them a few changes.

I wish particularly to explain that my propositions do not apply to streams of gentle flow, like those of the Netherlands, but to rivers like the Loire which are more or less torrential.

Mr. MAGANZINI. — I shall take the liberty, for my part, of not subscribing to Mr. Flamant's amendment which is unacceptable not only for Italy but also for Holland and many other flat countries.

There are rivers and rivers, and a distinction must be made. It is well understood that the system of levees is only applicable to plains through which pass important rivers of regular flow, and never to mountainous regions with torrential streams. We all agree, surely, that torrents must be regulated and held in check in another way. But the present question applies solely to plains, because the matter here is the « protection of low-lying lands against invasion by water ». Neither the General Reporter nor I could have dreamed of building levees along the torrents of the upper parts of a basin. For these reasons, I stand by my proposition to adopt the conclusions of the General Reporter.

Mr. FLAMANT. — I had in mind only rivers of large discharge.

Mr. GERARD. — The Mississippi and the Po are rivers of very large discharge.

Mr. FLAMANT. — I agree gladly to the conclusions of the General Reporter, provided that my observations appear on the minutes of the meeting.

Mr. DE HOERSCHELMANN. — The last two conclusions, handed in by Messrs. Maximoff and Wladimiroff, seem to me too special. I take the liberty of asking these speakers to be so kind as to withdraw their propositions. (*Agreed to.*)

The vote will now be taken on the conclusions relating to the fifth question.

The conclusions are : —

« 1. The use of embankments which cannot be submerged, with the object of preserving low districts from the encroach-

ment of the water of large rivers has succeeded in numerous cases ;

» 2. Insubmersible embankments built of earth can effect their object when the technical service is well organized and when maintenance works are well executed ;

» 3. The maximum of economic efficiency is reached by the erection of protective works and by the simultaneous execution of agricultural improvement works in the protected districts : sometimes it is necessary to have an artificial outlet for the water ;

» 4. Every step to be taken against the encroachment of the water should consider the changes which such steps might possibly bring about in the regimen of the river both above and below.

» It is therefore advisable to execute only such works as will form a complete whole, well proportioned in all its details and applicable to the entire basin of the river. »

THE PRESIDENT. — I call for the vote on the conclusions which have just been read.

The conclusions are adopted.

The meeting adjourned at 6.30 P. M.

FIRST AND SECOND SECTIONS TOGETHER.

FIFTH SESSION

Saturday morning, June 6, 1908

Mr. DE HOERSCHELMANN in the chair.

The meeting was called to order at 9 o'clock.

THE PRESIDENT :

Gentlemen,

Before taking up the question of the applications of armored concrete to river constructions and maritime works, I have the honor once more to call your kindly attention to paragraphs 16 and 17 of our By-laws. This I do in accordance with the desire of the Secretary General of the Permanent Association for whom, were these paragraphs not strictly observed, it would be impossible to prepare the minutes of the meetings of the Congress.

In other words, the length of a speech is limited to fifteen minutes and each speaker can take the floor but twice on the same subject. Again, each speaker is earnestly requested to hand to the Secretary the text of his remarks as soon as he can, and, under all circumstances, within the twenty-four hours at latest.

Is Mr. Drouguine, General Reporter of the communications on the application of armored concrete to hydraulic constructions, present?

Mr. BÉLÉLIOUBSKY. — Mr. Drouguine has asked to be excused; it is impossible for him to attend the meeting.

THE PRESIDENT. — As Mr. Drouguine is absent, allow me to read you the conclusions of his general report. These conclusions are expressed as follows :

1. Armored concrete, into the composition of which Portland cement enters, should not be used in sea water without the addition of some substance suited to protect it against the action of such water ;

2. The use of concrete in sea water is only that of an auxiliary, to facilitate the carrying on of the work ; for example, in building caissons for the construction of foundations at great depths ; but armored concrete is by no means to be considered as an integral part of works or as able to stand the various forces to which the works are exposed ;

3. The use of armored concrete is also to be avoided on inland navigation works at which, by reason of tides, winds or certain currents, the fresh water may become mixed with water from the sea ;

4. The use of armored concrete should be avoided, so far as possible, in those parts of hydraulic works exposed to the direct action of frosts, unless this action be prevented by protective measures ;

5. Where works are founded on piles, it seems well to saw off the piles below the level at which ice forms ;

6. It would be well not to use armored concrete in works exposed to frequent changes in the pressure of the water (dams, locks, etc.), so long as the phenomena, caused in the mass of concrete by reason of its permeability, have not been determined experimentally.

THE PRESIDENT. — Gentlemen, Mr. Abramoff, General Reporter for the communications relating to the applications of armored concrete to maritime works, has had to be excused ; in his absence, I shall ask Mr. de Roummel, President of the Second Section, to lay the question before you.

Mr. DE ROUMMEL reads the conclusions expressed in the reports of Messrs. Voisin, Moeller and Nicholsky and also mentions the report by Mr. Wouter-Cool, which describes a variety of works built in the sea.

Mr. DE ROUMMEL. — Gentlemen, it follows, from the extracts which you have just heard, that it is very hard to reach a wholly radical conclusion about the applications of armored concrete to hydraulic works and that it would be premature to wish to reach a final decision on this point. It is my opinion that the conclusions might be the same for the second section as for the first.

Mr. PROBST. — Gentlemen, I propose that the examination of the conclusions about armored concrete be put off until the General Reporter can have disentangled your respective conclusions and until it be possible to have a thorough discussion of each special point.

THE PRESIDENT. — I am opposed to an adjournment, as a matter of fact, but I would ask Mr. Probst to say until when he wishes to put off the session.

Mr. PROBST. — I propose to hold to-day's session at 1 P. M.

Mr. BÉLÉLIOUBSKY. — I would state that the General Reporter has said that he could not come.

THE PRESIDENT. — Those who are in favor of adjourning until one o'clock will please rise.

The proposal to meet later is lost.

THE PRESIDENT. — Does any one wish the floor?

Mr. VOISIN. — Considering that the conclusion of the first and second sections should be identical, it seems to me hard and, in any case, it would be a matter of regret to adopt the conclusions which have been read.

It is said that cement mortars are always destroyed in the sea, and, consequently, that armored concrete should only be used for temporary work.

Now, we have to-day, especially at Southampton, an example of armored concrete which has stood for more than ten years without showing any signs of destruction.

Again, nothing in the reports presented bears out the pessimistic conclusions against which I rise.

On the contrary, it is proper to be on one's guard as I have been in my conclusions.

So, I propose either to take up my own conclusions which are very moderate or else to adopt none, so as not to engage the future under conditions which we may have cause to regret.

THE PRESIDENT. — Mr. Valdès Humaran.

MR. VALDÈS HUMARAN. — I agree with most of the reporters in the matter of the easy decomposition of cement mortar in the sea ; but for natural cements, like the so-called *Mediterranean Portland* or *grappier* (1) cement from Teil, which come from very uniform limestone beds and contain a large amount of silica and very little alumina, I can state positively that, taking as a basis the results given by our works which have been in existence for forty years and my own personal experience of 28 years, they behave admirably in sea water, as during this long period they have become as compact as stone, so much so that, in order to demolish a part of the old quays built with this excellent material, explosives had to be used.

The idea was then put forth to use *grappier* cement for building the great monolithic blocks of the new Barcelona break-water, already described at the Congress of Milan, at the time of the preliminary tests, and which I find incorrectly described in a few of the reports heard, in this sense that these blocks are not made of armored concrete.

The great monolithic blocks at Barcelona are made of concrete molded in the ordinary way without any kind of strengthening, either at the base, in the longitudinal walls or in the intermediate bulkheads, and it is just this special feature of their construction which tends to solve *two* questions of the highest importance, namely : to avoid the more or less rapid decomposition of the armored concrete due to its constant immersion in sea water, and to obtain a maximum economy of first cost by not resorting to expensive materials.

These blocks are now currently made, and I think it may be interesting for my colleagues to have a little information as to

(1) In the manufacture of cement the *Grappier* is a mixture of the undercal-cined, the overcal-cined and fragments of hydrated limes. It makes a slow setting cement of excellent quality. Trad.

the present way of making them. You know already, Gentlemen, that these blocks are towed afloat, like an ordinary barge, and that they are placed very easily by means of valves which are opened all together and worked from the upper edge. This being done, their filling must be provided for ; this is the problem where solution had to be sought and we believe that it has been solved successfully.

The direct deposit of the concrete in the compartments under water was not to be thought of on account of the inevitable washing out of the mortar. The use of small artificial filling blocks was forbidden rightly on account of the difficulty of obtaining with this system a perfect bond between the two distinct sorts of materials of the outside envelope and the inside body. These conditions led to the use of natural stones of which the dimensions were neither too large nor too small so as to avoid, on the one side, the alleged disadvantage against artificial blocks and on the other, that arising from an exaggerated reduction of the voids to be filled with mortar.

The problem consists in filling the compartments by means of medium sized rough stones to a height of 1.40 m., sufficient to ballast the caisson and to find a satisfactory way for filling the voids after having pumped out the water.

The long experiments, to which various systems of tests gave rise and especially the use of injecting pumps, which did not yield good results on account of the more or less quick choking of the tubes, in spite of the great fluidity of the mortar, will not be described. Then, resort was had to the direct pouring in of the mortar at many points by using rich and rather fluid concrete, counting on the combined action of weight and shock. The result was surprising, and the filling was perfect as was found by the volume of the mortar which was exactly equal to that of the voids, and by the compactness of the finished block.

This question so simply solved was a true Columbus' egg ; the old molds were changed and replaced by others which were much more practical and allowed *two* successive blocks to be built.

The method followed has been described in a special article . the process adopted is due exclusively to Messrs. Monda and Gonzalo, the engineers of the work, who thus gave a new proof of their ingenuity.

The concrete of which the caisson block is constructed is made of *grappier* cement from Teil, in the following proportions per cubic metre : —

For the bottom : 300 kilogrammes (= 660 pounds) of cement, 800 litres (= 28.55 cu. ft.) of gravel, 400 litres (= 14.27 cu. ft.) of sand. For the outside walls and the bulkheads, the proportions of sand and gravel are the same but 400 kilogrammes (= 880 pounds) of cement were used.

The sides and bottoms of the blocks are not wholly water tight under the effect of the pressures to which the walls are subjected, and for these it was necessary to resort to a coating of mortar made of cement and fine sand in the proportions of *one volume of cement to one-and-a-quarter volumes of sand*. The water tightness obtained in this way, if it be not absolute, is at least quite sufficient for the time of towing and complete setting in place, an operation which lasts about three hours, during which the water filtering in rises to a maximum height of 2 or 3 centimetres on the bottom of the block.

The time spent in making a caisson, including all the operations described, is about eighty-five hours.

The yard is large enough to build 20 blocks a year, giving to each a month for drying. If the time for seasoning were reduced to twenty-five days, the number of blocks would be 24, which represents a length of 446.40 m. of the jetty at the line of the base of the superstructure. But, considering that smooth water must be waited for in order to use these big caisson blocks, a space is prepared in the outer harbor sufficiently large and deep to hold eight of these units, so as to clear the yard when more blocks have been made than the state of the sea will allow to place.

In accordance with the finally approved unit prices for the manufacture and sinking of these monoliths the cost per lineal metre is, everything included, 1,403.72 pesetas (= \$271.76), and that of a lineal metre of masonry of the breakwater is 33.42 pesetas (= \$6.45).

Such, Gentlemen, is the information which completes the description of this new system of caisson blocks which has already given good practical results, and which would certainly give still better if you would kindly lend it your assistance in reaching a higher degree of perfection.

Mr. MULLER. — Gentlemen, I think that many of you will be surprised at the resolutions of the General Reporter.

I am astonished at finding only negative solutions at all points. I think that the positive results obtained should also have been mentioned. The advantages of armored concrete over other materials appear clearly from the many works on which it has been employed. The advice to refrain from using armored concrete in fresh water, where frosts are abundant, cannot be sustained. There are at Berlin bank revetments and quay walls made of armored concrete which have stood well for 18 years, or since 1890. All the tests made up to now on inland waterways speak in favor of armored concrete, be they walls or revetments, steep or sloping. In like manner, so far as piles are concerned, nothing unfavorable is known. Piles of armored concrete have stood particularly well. I have mentioned in my report a great many advantages obtained by the use of armored concrete. In the matter of inland navigable highways, the question is, I believe, thoroughly cleared up and armored concrete can be well recommended for the revetments of banks. This is why I propose again to treat the question in so far as it concerns inland navigable highways

THE PRESIDENT asks Mr. Müller to make his proposition in writing.

Mr. MULLER. — Here is how I should state my proposition :

« May the meeting decide : —

» 1. That the use of armored concrete on inland navigable highways shall form the object of a question at the next Congress ;

» 2. That the results observed in the use of armored concrete in maritime constructions might be set forth in the shape of communications. »

Mr. SCHULTZE. — Like the preceding speaker, I must express my astonishment that the conclusions of the General Reporter should be so extraordinarily unfavorable. It seems to me that the disadvantages have been too much noticed and the advantages have been too little brought out. I have obtained this impression, that good results have been found on inland naviga-

ble highways. I would ask that the following be introduced into the Müller proposition : —

« In view of the favorable results obtained so far by the use of armored concrete on inland navigable highways.... »

Mr. MULLER. — I accept this amendment.

THE PRESIDENT. — I ask you to state your proposition in writing.

Mr. BÉLÉLIOUBSKY says that he will speak in German and then sum up his remarks in French.

For the sake of greater clearness, the question will be divided into two parts : —

1. The use of armored concrete on inland navigable highways ;

2. The use of armored concrete in maritime constructions.

I have read the five reports handed in and I must support the observations of Messrs. Müller and Schultze. All the reports speak favorably of armored concrete. In my opinion, one cannot help recommending its use on inland waterways.

We all know that the use of armored concrete, made of Portland cement, has given rise to many different opinions during the past ten years. The discussion is still going on as to whether the favorable results are greater than the unfavorable. In the Möeller report, Wilhelmshafen, it is said that an addition of trass is to be recommended, details of the mixture are also given. Mr. Voisin also gives examples of work carried out and advises, in ending, to add other materials to the concrete so as to avoid the penetration of sea water. The outside can also be covered with a rich coating. I believe that theoretical researches have shown that the use of armored concrete in maritime construction has not yet been cleared up entirely. The advice to add other materials to the armored concrete is good. In my opinion the resolutions could be broadened. Of late years, tests have also been made in Russia in relation to the addition of volcanic products in the construction of ports. The Ministry of Commerce (Department of Maritime Constructions) has discovered a great bed of pozzuolana in the Crimea. I might exhibit samples of these additional materials which are to be recommended.

Gentlemen, I agree fully with Professor Müller's proposal that the application of armored concrete to river constructions be inserted as a question in the programme of the next Congress, the importance of the use of armored concrete in works of this sort being a recognized fact. But the question of the application of armored concrete to maritime constructions might remain on the programme as a communication while waiting until the studies relating thereto become further advanced. In any event, I think that, in the matter of applying armored concrete in fresh water, a conclusion could be drawn up saying : that, for constructions in fresh water, armored concrete should be recognized as being very important both technically and economically.

As to the application of armored concrete to maritime works, I do not think that a negative expression can be made on this point. The most that we can say is that the application of armored concrete in sea water can be made when every precaution for preventing the mortar from being dissolved has been taken.

It is known that, in the concrete employed in maritime constructions, the cement is composed of free lime which might be attacked by the water of the sea. The resolution of the Section as to the application of armored concrete to these constructions might be made subject to the reserve that this question be studied in all its bearings.

Mr. WORTMAN. — I too, Gentlemen, have been struck by the conclusions of the General Reporter which contain a negative judgment about the application of armored concrete to hydraulic works in sea water.

In Holland, several important works have been carried out with armored concrete. These have been exposed to the action of salt water and, so far, the results have been quite satisfactory. For the last eight years, trass has been added in the Netherlands to Portland cement for all concrete structures exposed to the action of sea water. The concrete blocks for the Scheveningen jetties have been made with mortar composed of one part of trass to two parts of Portland cement, which has given good results.

I think that it would be well to have the question of the application of armored concrete to maritime constructions placed on the order of business of the next Congress and therefore I

agree with Mr. Müller's proposal. It is desirable that a study of this subject should continue.

I would also invite your attention, Gentlemen, to the tests I made at Ymuiden and of which mention was made in the report of Mr. Wouter-Cool. Test beams 2 metres long were made of armored concrete at Ymuiden and were then loaded at the middle with a weight of 400 kilogrammes, so as to bring on the iron a tensible strain of 1,200 kilogrammes per square centimetre (\approx 17,000 lbs per sq. in.). These beams were placed at a level midway between low and high tides, and were left exposed in this way to the alternate action of the sea water and the air for three years. At the end of this time, these beams, which showed no formation of fissures, were broken and the iron was found wholly intact. This is rather a satisfactory result in favor of armored concrete, but it is necessary that further tests of this kind and other studies be made in order to cast light on the question before us.

THE PRESIDENT. — Gentlemen, we have here three propositions on the subject of the conclusions : that of Mr. Voisin, that of Mr. Müller in which Mr. Schultze joins, and finally that of Mr. Bélélioubsky.

Mr. BÉLÉLIOUBSKY. — I accept the resolution offered by Mr. Müller.

THE PRESIDENT. — This being so, there remain only the proposal of Mr. Müller and that of Mr. Voisin.

Mr. Voisin, will you be so kind as to read all your conclusions as you would like to see them expressed.

Mr. VOISIN reads the conclusions of his report.

Mr. VOISIN. — I will add that if the second Section should not think that it could adopt conclusions of this sort, which are very moderate, then I would accept the proposition of Mr. Müller, that is to say, the adjournment of all conclusions, provided that the consideration of armored concrete be placed as a question in the order of business of the next Congress, both as regards its use in fresh and salt water.

THE PRESIDENT. — Can we not agree on this point?

MESSRS. MULLER and SCHULTZE. — Our proposition could be stated in this way : « That, in view of the great importance of » these materials and of the favorable results obtained, the » limits of the use of armored concrete on inland navigable » highways appear as a question in the order of business of » the next Congress, and that the limits of the use of armored » concrete in maritime works be also discussed by the same » Congress. »

THE PRESIDENT. — There only remains now to vote on the conclusions of Mr. Müller. Those who do not consent to accept these conclusions will please rise.

MR. VOISIN. — I must remind you that I only accept Mr. Müller's proposition if my first conclusions be not adopted. Furthermore, I have drawn up the following new conclusions.

THE PRESIDENT reads Mr. Voisin's second conclusions which are as follows : —

« So far as the use of armored concrete in the sea is concerned, if it be the part of prudence to appear very reserved, it is » also to be considered that the first results are encouraging and » that, by adopting a certain number of precautionary measures intended to prevent sea water from penetrating (such as » those mentioned by various reporters), armored concrete gives » the means of carrying out certain works in special cases in » which other materials are less advantageous. »

MR. VITTA. — I consider that armored concrete has not yet been tested as it should be to allow its use as ordinary materials are used ; hence I accept willingly the motion which has been proposed to adjourn the solution of this question to the next Congress. This motion has one advantage : we hope for good success from armored concrete, and the new tests, which will be undertaken with the precautions pointed out by several reporters, will serve as experiments which will be fruitfully discussed at the next Congress. Our information will then be more exact and we shall be in position to give a vote of confidence. This is why I accept the motion.

MR. MALLET. — The two motions before us are not contradictory, and if you will accept Mr. Voisin's as the first,

Mr. Müller's comes legitimately and naturally second. I believe, furthermore, that this is the opinion of a part of the Committee.

THE PRESIDENT. — Will the Secretary please read the whole ?
The following is the text of the proposed motion : —

- « 1. As to the use of armored concrete in the sea, if prudence
» counsel reserve, it is to be considered that the first results are
» encouraging and that, by means of the adoption of a certain
» number of precautionary measures intended to prevent pene-
» tration by sea water (such as those pointed out by several
» writers), armored concrete allows the carrying out of certain
» works in special cases where other materials offer fewer ad-
» vantages ;
» 2. Seeing the favorable results of experience and the great
» importance of armored concrete, its application to highways
» of inland navigation and to maritime works should be put
» down as a *question* in the order of business for the next Con-
» gress. »

THE PRESIDENT. — The two proposed conclusions are thus united. It remains to be found out whether Mr. Müller consents.

Mr. MULLER agrees.

THE PRESIDENT. — Allow me to call for the vote (1) on the conclusions as they have just been drawn up. If any one object he will please rise.

No one rises.

The conclusions are carried unanimously.

The meeting adjourned at 11 o'clock.

(1) In accordance with article 14 of the By-laws of the Permanent International Association of the Congresses of Navigation : « Communications are » neither voted on, nor considered at general meetings ».

FIRST SECTION
(Inland Navigation)

SIXTH SESSION

Saturday morning, June 6.

Mr. DE HOERSCHELMANN in the chair.

The meeting was called to order at 11 o'clock.

THE PRESIDENT. — Gentlemen, we will now take up the examination of the second communication which is stated in these terms : —

Ways in which the Government and various interested parties can share in supplying the funds necessary for the development of inland navigation, including, if needs be, the faculty to be conferred on the Government of obtaining possession of a part of the land which will be improved alongside of the new waterways.

The General Reporter, Mr. KOUNITZKY, has the floor.

THE GENERAL REPORTER mentions that he has found it a very difficult task to sum up the articles presented by the reporters ; he thanks them for the remarkable works submitted by them to the deliberations of the Congress. He then reads his general report and lays down the following conclusions : —

« 1. Of all the financial means for creating and improving inland navigation lines, the ordinary State budget is the most regular and the one most to be recommended.

» Loans are justifiable in countries where the navigation lines are in a primitive condition or where the ordinary resources of the budget are also insufficient.

» They can be redeemed by taxes levied on the boats and by special rates on the increase in value of the lands and buildings adjoining the new route. The organizations and institutions which are interested can obtain redeemable grants from the State.

» The taxes should absorb only a part of the profit obtained by the reduction of the cost of transportation due to the establishment or improvement of a line of navigation.

» Taxes should form a separate account and their levy should cease from the time that the different expenses are met.

» The rates on the increased value of land and buildings should not exceed in amount the half of the increased value.

» The construction, maintenance and direction of the principal navigation lines should remain wholly in the hands of the State, the different parties interested being able to take part by lending their financial aid and as members of the Inspection Committees ;

» 2. In order to facilitate the establishment and improvement of navigation lines and local branches with these lines and to guard against speculation in land values, the law should give the State and the organizations and institutions interested, the right of dispossession in all cases in which this may be considered indispensable for the public welfare.

» Sufficient land should be condemned to provide not only for needs of construction but also for a future extension of the establishments and installations connected with the navigable highway, and to prevent speculation.

» The condemned ground may be leased to interested parties, and it may be resold at cost price but only under wholly exceptional circumstances ;

» 3. Local bodies (municipalities, boroughs, associations, industrial societies, etc.) may be entrusted to secure the funds necessary for the construction, extension or improvement of river ports, landings, docks and warehouses and for the various equipments of these ports, as well as for the local lines of approach and connection from settlements, factories and centres of production to the navigable highway.

» These funds can be obtained by means of a loan guaranteed by special taxes levied on the loading and discharging of boats as well as on the increased value of land and buildings.

» It would be necessary to organize, for this purpose, syndicates or special bodies along the highways of inland navigation.

» The State can share in these financial arrangements by subsidies which are to be paid back ;

» 4. To manage lines of inland navigation, to find the movable plant for transportation and to provide the various installations in river ports, private enterprise is admissible in the form of concessions, subsidized or not by the State or by public bodies ;

» 5. As a first step toward inducing private enterprise to become more or less interested in the improvement of highways of inland navigation, it must be assured of as great stability as possible by means of legislative action without injury to public interests ;

» The development of the system of navigation lines and the raising of the necessary funds should be the object of a regular programme worked out by the State with the aid of all interested organizations and institutions. »

THE PRESIDENT. — Mr. Escalas has the floor.

Mr. ESCALAS. — It is hard, upon a mere hearing, to form a clear idea of the conclusions just read by the General Reporter. With no desire to change these in any way, I should like to offer a few considerations as to the part which private initiative should play in the matter of inland navigation.

The State is not bound to provide for everything. As in many other conditions of economic life, it should do no more than what is indispensable. Private initiative, individual or collective, is the seed, the germ to which the State owes the necessary care for its development. That which is inadmissible is the indifference of Governments to such vital questions. Their duty is to stimulate drowsy initiatives and to become the prime movers of commercial and industrial life.

Considering the administrative systems of most States and the demands of modern river traffic, the development of inland navigation cannot be conceived without governmental cooperation.

In spite of very different economic conditions, in spite of the very varied action of sea ports and especially of ports with

inland connections, it may be said that most of them owe what they have become to direct and pecuniary support of States. Save the English proprietary ports, such as Cardiff and Penarth, save other ports belonging to railway companies and handled as industrial or commercial enterprises, and, finally, others like Barcelona, which is developing daily with its own means, there are few which have not received directly or indirectly from the State the subsidies necessary for their establishment or for their enlargement.

As a matter of principle, therefore, State aid seems indispensable for favoring the development of inland navigation, and the more so as rivers and canals demand, on the same ground as railways, State intervention just in order to make the service regular, to lay down the economic dispositions to be taken for carrying on indispensable works, to exercise the necessary right of eminent domain, to watch over interests in the same field and sometimes in opposition.

In spite of all this, Governments should assist in the success of private initiatives only to the point where these may be considered, for a longer or shorter period, as being of general interest. The State does not owe an equal amount of aid and protection to every port; it should concentrate its support, reserve it for those which are or could be in position to compete with the other ports of the world. This is what the character of modern economic struggles demands.

Germany may be proud of having prepared the most complete plan of inland navigation in existence, spending largely but judiciously to endow herself with the canals from Dortmund to the Ems, from the Elbe to the Trave, to dig the navigable highway which joins Stettin to Swinemunde and that from Pillau to Königsberg, casting millions into the Rhine, the Oder, the Elbe, the Weser, etc., in order to fill them to the full with productive riches.

Now, it is just this nation which offers us a marked example of the way in which Governments can assist in private enterprises. It was a Westphalian manufacturer, Mr. Frederic Hartort, who, after persevering efforts, brought about in 1869 the creation of the Central Association for the Development of Navigation on the German Rivers and Canals (*Central-Verein für Hebung der deutschen Fluss- und Kanalschifffahrt*) and the pre-

sentation of the official project for a navigable highway between Ruhrort and Emden.

That is certainly the plan to follow. Considering that in creating or developing inland navigation, many elements are brought into play : agriculture, industry, commerce, the landed property of the basins considered, it is to be desired that the initiative start from these elements themselves. But once the probabilities of success for the enterprise are established and the influence which its being carried out may have on the collective interests of the nation, the State should guide and protect this initiative and place upon it the official stamp with all the benefits which this involves.

The State can first of all favor the enterprise by exempting the society which is formed from general and special taxes or at least by reducing these last. It can also start a quick form of official assistance by giving its guarantee, after approval by its technical department, which might, if needs be, take the initiative itself of these plans and projects.

Among the facilities which Governments may give to collect the funds necessary for carrying out the works, subsidies must be mentioned in the first place, these either to be paid all at once after having appeared in one or several successive appropriation bills, or paid over in the form of a certain proportion of the value of the works as these are completed. The State can also facilitate the emission of loans or give the money directly to the societies and let them have the advantage of a rate of interest lower than that current. Lastly, there is nothing to prevent granting premiums to river navigation, such as those given to certain maritime companies, in proportion to the tonnage carried and the distance travelled, or to make concessions on entrance dues into regions where construction is lacking. This construction can itself be favored in this way, so as to bring into use an equipment of national manufacture.

It is understood that all the measures mentioned are not to be adopted together ; they must only be resorted to in exceptional cases and the rule cannot be the same for all countries. The administrations of the different regions have to determine the best system, answering in each case to the public interest, and any taking of sides would be accompanied with sad consequences.

By applying similar arrangements according to circumstances

as they arise, Governments will see the birth of great undertakings without which their peoples cannot carry on any successful struggle under the modern conditions of commercial activity.

THE PRESIDENT. — Mr. Mallet has the floor.

Mr. MALLET. — It seems very hard, in such complex questions, to say exactly what steps should be taken.

I agree with Mr. Escalas on this subject. In order that it may be considered, I request that the conclusions of the General Reporter be completed by the following addition, on the wording of which Mr. Escalas and I agree :

« The application of these projects is subordinate to the spirit, customs and legislation of each State ; it can have no uniform nor absolute character. »

THE PRESIDENT. — Mr. Maximoff has the floor.

Mr. MAXIMOFF. — While accepting the conclusions of the General Reporter, I take the liberty of seconding the observations just presented by Mr. Escalas. It is important that private initiative should be highly appreciated under all circumstances and that its development should be furthered.

Private initiative seems to me especially desirable for mixed enterprises, that is to say, those which combine the interests of navigation, of irrigation and of the factories using hydraulic power.

In these cases, the administrative machinery is too clumsy and the State will never be able to obtain from such enterprises as great productiveness as would a private society.

THE PRESIDENT. — Mr. Ptschelnikoff has the floor.

Mr. PTSCHELNIKOFF. — Among the communications which appear on the order of business of the first section, there is a question of creating new pecuniary resources with the view of favoring the development of inland navigation.

I consider it useful and desirable that such resources should be created, therefore I take the liberty of laying before you what follows :

Under the law, Russian inland navigation is considered as free of all taxes. In order to develop and extend navigation,

the Government has granted free use of the towpaths covering a strip of ground 10 sagues (= 70 feet) wide on each bank of the river.

Nevertheless, the provinces (*zemstvos*), cities, towns and even villages tax navigation for the use of these towpaths, as well as for passing under bridges, while they spend nothing with the direct object of improving the navigable highways.

The taxes for passing under bridges are much greater than the costs of manœuvring these bridges.

At some points the dues are so high that they completely cover all the costs of maintaining the bridges; all the same, these bridges are not built for the needs of navigation.

As a matter of fact, Russian navigation, which the law holds free of all dues, is taxed for the benefit of cities, towns and the province.

The Government frees navigation in the interest of the nation, whereas the province, the villages and the towns overload it with taxes.

It is to be noticed that Russian navigation is not grouped in the form of societies. As every one works on his own account, there is no possibility of acting methodically in the interests of navigation, and all the more is this the case as there exists no right of taking part in the deliberations which have as their object the improvement of the operation of the waterways.

In order to provide a remedy for this situation, it is very desirable to have institutions of navigation formed with a determined radius of action, these institutions to have the same rights as Committees of the Exchange and as River Committees.

I propose the formation of these societies by radii, because they are indispensable on account of the great extent of our country and the economic conditions which control our navigation.

On the other hand, it is impossible to intrust the interests which are occupying our time to a single central society of navigation.

I ask the Congress, therefore, to be so kind, in view of our discussion relative to the creation of pecuniary resources for the development of inland navigation, as to express an opinion on the following fundamental questions : —

1. Is it desirable to exempt navigation from dues which are

not intended to be used for the maintenance and improvement of navigable highways?

2. Is it desirable to form navigation societies by radii in order to increase the commerce of these highways?

THE PRESIDENT. — Mr. Kounitzky has the floor.

Mr. KOUNITZKY. — I agree willingly to Mr. Mallet's proposition which is in perfect accord with the spirit of the various reports presented. Furthermore, there is no contradiction between it and my own conclusions.

Mr. ESCALAS. — I take the liberty of asking the General Reporter to be so kind as to read the complete text of what is proposed.

THE GENERAL REPORTER reads once more the general conclusions.

These propositions are accepted by the meeting (1).

The meeting adjourned at noon.

(1) In accordance with Article 14 of the By-laws of the Permanent International Association of the Congresses of Navigation : « Communications are » neither voted on, nor considered at general meetings ».

FIRST SECTION
(Inland Navigation)

SEVENTH SESSION

Saturday afternoon, June 6, 1908.

Mr. DE HOERSCHELMANN in the chair.

The meeting was called to order at 12.10 P. M.

THE PRESIDENT. — The third communication of our programme has to be examined ; it is stated thus : —

Hydrometric Service, Prevision of Floods and of Depths of Water.

Mr. Kleiber, the General Reporter, had to be excused for not being able to be present at the meeting.

Mr. Maximoff has been so kind as to undertake to read the general report, and I ask you to notice, Gentlemen, that this article gives no conclusions.

Mr. MAXIMOFF communicates to the meeting the work of the General Reporter.

THE PRESIDENT. — I thank Mr. Maximoff. Mr. Valentini has the floor.

Mr. VALENTINI. — I do not wish to abuse the patience of the members of the section at the moment when the labors of the Congress are approaching their end ; I take the liberty, however, of saying to you a few words on the subject of a question which I wish to submit to the examination of the section.

The motion as to which I should like to have you take a decision seems, at first sight, to offer only a theoretical interest ; as

a matter of fact, the question is one of real importance for navigation and boatmen, and your approval would involve a practical conclusion which would be of the utmost use for all countries.

Considering that the science of the prevision of floods and low water is founded entirely on hydrometric and pluviometric observations ; considering, on the other hand, that if these observations are made on a large scale in some countries, they are but little employed in others ; as, furthermore, the methods of observation are susceptible of improvement, I offer the following motion : —

« There should be established on the greatest scale and by all possible means a large number of hydrometric and pluviometric observation stations, furnished with the most highly approved self-registering apparatus ; and existing stations should also be developed and improved. »

THE PRESIDENT. — Mr. Oppokoff has the floor.

MR. OPPOKOFF (in German). — This third communication of the First Section of the XIth. Congress is the only one which treats of practical navigation and of the scientific study of rivers considered as forming a part of physical geography and especially of the new branch of this science called « potamology » or the special study of rivers.

Considering this question from this point of view, that is to say from the specially scientific point of view of the application of the data obtained by the aid of hydrometry, the relatively narrow frame of this communication might have been made a little wider.

Still, without going too far beyond the limits assigned, I take the liberty of using the time reserved for me to call the attention of the members of the section to three pamphlets which I have published in reply to the third communication but which unfortunately, could not appear in time and do not figure among the publications of the Congress. You will hear of them through other channels ; it is in this way that the first pamphlet appears in the *Bulletins of the Imperial Academy of Sciences* at St. Petersburg.

These three communications treat of the study of river

discharge regimen during different years and periods of years ; they show, besides, certain recently obtained new data as the result of the study, pursued during more or less long periods of time, on the relation which exists between atmospheric precipitations and the discharge of river basins.

I shall hand the President a brief résumé, in French and German, of these three pamphlets, in order that mention may be made of them in the minutes of the proceedings of the Congress. The members of the section who are interested in the questions treated in these pamphlets can look them up in the originals.

I propose at most that the question of the relation of the regimen of rivers to atmospheric precipitations and other conditions and local circumstances of the flowing off of water be set down in the order of business of the next Congress.

The title of the first of the communications which I have just mentioned is : —

Simple method for studying the regimen of rivers during different years and its application to the Basin of the Dnieper.

Its object is to invite your attention to a very simple method, by means of which all the characteristic peculiarities of flow in a given river basin can be made clear in detail even without having exact and long continued data about the discharge, and having at hand only observations made of the level of the rivers.

This method can be applied very easily even to large rivers, because, if it be very difficult to obtain data about the river discharge — and this is especially the case with large rivers — the observations made on the height of the levels are numerous and cover long series of years.

The base of this system is very simple : it consists of the graphic comparison, during a series of years, of the curves of oscillation of the level in the course of each year with the mean or normal curve of the same oscillations drawn during a long period of years at the same point of observation.

This curve is reproduced, on the chart alongside of the first, for each series of annual observations.

The detailed results of this method, applied to the basin of the

Dnieper, are enumerated at the end of the above-named monograph which has been distributed to the members of the Congress (1).

The second communication is called : —

Periodic variations of long duration in the discharge of rivers and in the atmospheric precipitation in river basins.

Its principal object is to bring out the existence of oscillations in the curve of the flow of the water, oscillations which cover periods of several years and depend upon analogous variations in the quantity of atmospheric precipitation in river basins.

It must be remarked that it is easy to draw false conclusions from the sudden and progressive drop of the discharge and of the flow of the waters in general, if no account be taken of the periodical variations of the atmospheric precipitations and of the discharges of river basins, as is proved by the example of

(1) The author does not stop at a mere comparison of the normal curves of level and those belonging to each year ; he also examines parallelly on the same sheet the variations of atmospheric precipitations and of the temperature of the basin for every year in regard to the normal quantity of precipitation and the mean temperature.

For the last two curves, the indications are made monthly, for the curves of level they are made every five days.

By means of this graphic comparison of the hydrometric and meteorologic data, the author has been enabled to prepare a complete and demonstrative table of the distribution of the discharges and precipitations from the end of the year 1876 to 1905 for the entire basin of the Dnieper above Kief, for an area of 35,575 square kilometres (= 129,565 square miles) as well as in three other parts of the basin, forming altogether four graphic charts, one for the whole basin and each of the others for one of the parts.

The author was able thus to determine the intimate relation which exists between the variations of the normal height of the level of rivers, especially in summer and autumn, and the corresponding variations of the atmospheric precipitations of the same basin.

He could also note the difference and the characteristic peculiarities shown by the variations of the meteorological elements and of the heights of the levels in their simultaneous movements during the same years, in several parts of the basin of the Dnieper which differ from each other in their relief, their vegetable stratum and by other local conditions of discharge.

These observations in their turn allow a few conclusions to be drawn on the subject of the influence of the local factors on the discharge of the river.

the Austrian engineer Weix, who predicted every seventy years a similar drop, not only partially in river basins, but in all cultivated countries (1).

The third article is entitled : —

*On the accumulation and consumption of humidity
in the soil of the basins of rivers flowing through plains (2).*

Summing up this third article, the speaker utters the desire to see his conclusions verified for other basins in flat countries,

(1) The author has had recourse to a whole series of long time observations which bear on precipitations and on discharges and in part also on the level of rivers.

From the examination of the graphic charts which accompany the text, it follows that the oscillations of the discharge, not only the absolute but also the relative ones, as well as those of the coefficient of the discharge, compared with the mean value of the five years curve of observations, are parallel to the variations of atmospheric precipitations in river basins.

The duration of these oscillations is much less than that of the 35 year periods for the variation of the climate, according to the Bruckner.

The identity of the progression of the oscillations of the precipitations and discharges is shown simultaneously for a few periods in different river basins.

The existence of these periodic oscillations is confirmed by the examination of the data of the discharges and precipitations of the Elbe, in Bohemia, from 1874-1895 and of its tributary, the Zale, from 1872-1901, by observations on four less important rivers of North America from 1863 to 1900 and, finally, by the personal work of the author on the data of the Dnieper from 1876 to 1901.

The author also mentions, and compares them with the mean value of the five years observations, the older and also the surer data (such as the unchangingness of the beds of rivers) relating to variations of levels in the Seine at Paris from 1731 to 1858, of the Rhine at Düsseldorf, from 1800 to 1879 and of the Dnieper near Ekaterinoslaw, from 1852 to 1907.

(2) This communication shows, by the studies and comparisons made by the author during twenty-nine years, from 1877 to 1905, of the data relating to the precipitations and discharges of the basin of the Dnieper above Kief, that the precipitations of this basin, of which the area is 335,575 square kilometres and in which the mean annual precipitation is 0 m. 554 (= 21.81 in.), cannot suffice for evaporation during periods of drought which often happen in two consecutive years.

This lack can only be made up by the absorption of the humidity of the ground and in part of the subterranean waters which are reached by the roots of plants and trees, for example in marshes and marshy forests.

Such an « expenditure » or « consumption » is restored in the wet years which follow the dry years when the reserves of dampness and subterranean water,

of which the permeable soil, and the continental climate may be comparable with those of the basin of the Dnieper.

THE PRESIDENT. — The majority of the Executive Committee is of the opinion that there is no reason for drawing up any conclusions on the subject of the third communication (1).

Mr. VALENTINI. — Still, it is to be desired that the Section of the Congress lend its authority to the proposition to create

absorbed during the previous years « accumulate » or more strictly speaking, are reconstituted in the soil of the basin.

This conclusion follows from the examination of the difference between the quantity of the precipitations and that of the discharges of the various hydrographic years, and especially during the damper years which, as a rule, follow immediately after the dry years.

The difference then becomes exceedingly great and cannot be explained at all by a high evaporation, as the temperature reached in damp years in the basin of the Upper Dnieper is generally below the normal.

The great absorption of the precipitations of the basin can only be caused under such conditions by the soil of the basin which has been dried up by the preceding years of drought. On the other hand, it is generally noticed during dry years that there is little difference between the discharge and the atmospheric precipitations; this difference is far from corresponding with the real quantity of evaporation of the basin during the warm and dry years, in which, as the result of the evaporation of the vegetable stratum, all the water fallen on the damp bottoms and a part of the subterranean water is absorbed. The mean value of the atmospheric precipitations for a period of several years is 0.419 m. (= 16.50 in.) in the basin of the Upper Dnieper; it corresponds to the mean loss of humidity by evaporation. Comparing this mean value with the difference between the atmospheric precipitations and discharges during various years, it is noticed that the maximum quantity of « consumption » of humidity of the soil during dry years and that of « accumulation » during the following more rainy years are nearly equal to each other and that they reach the remarkable height of 0.110 m. (= 4.33 in.). Hence they are during certain years but slightly inferior to the mean annual discharge of the basin, which is 0.135 m. (= 5.315 in.) or 24.3 % of the water which falls.

The observation of the insufficiency of the water which falls for evaporation and the reserves of moisture of the soil during dry years is certainly significant and explains the hydrologic part played by forests and marshes in general and their influence on the flow of rivers especially at low water.

The author dwells on the explanation of the hydrologic part taken by marshes, the influence of which has been less studied than that of forests.

(1) In accordance with Article 14 of the By-laws of the Permanent International Association of the Congresses of Navigation: « Communications are neither voted on, nor considered at general meetings ».

hydrometric and pluviometric stations. This was the sole object of the conclusion which I drew up.

The study of this question might be placed on the programme of the next Congress.

THE PRESIDENT. — It is needless to say that no one will dispute a truth recognized by all the world. I consider, however, that it is not worth while to draw up any conclusion.

Mr. VALENTINI. — I thought it useful to give my motion the authority of the Congress. But I shall not dwell longer on the subject.

Mr. ELAGUINE. — The system of points of observation should be extended as much as possible and their number should be increased, considering that the observers, who obtain interesting and useful conclusions for navigation by their studies on the previsions of high tides, have but a restricted series of instruments at their disposal. For this reason, I second Mr. Valentini's proposition.

The meeting adjourned at 12.30 P. M. without taking any decision.

SECOND SECTION

(Ocean Navigation)

BOARD OF THE SECTION

PRESIDENTS.

MM. Roummel, L.-J., Conseiller d'Etat actuel ; Director of the Works at Reval Harbour and of the Coastal Works of the Baltic Sea ;

de Schokalski, J.-M., Major General of the Imperial Russian Navy ; President of the Physical Geographical Section of the Imperial Geographical Society ; Chief of the Meteorological Department of the Hydrographical Service of the Ministry of Marine.

VICE-PRESIDENTS.

Germany :

MM. Bubendey, J.-F., Wasserbaudirector of the Free and Hansa City of Hamburg ;

Weigand, Dr. H., General Director of the North German Lloyd

Austria :

von Fries, Alfred, Ministerialrat.

Belgium :

Troost, Directeur Général des Ponts et Chaussées.

France :

Kleine, Inspecteur Général des Ponts et Chaussées.

Hungary :

MM. Kohanyi, Z., 1st. Class Lieutenant of the Imperial and Royal Navy, Chief Inspector for Ocean Navigation (Hungarian), Budapest.

Italy :

Rota, Guisepppe, Director of Naval Works at the Royal Dockyards at Castellamare di Stabia.

Japan :

Uchida-Kakichi, Director of the Mercantile Marine Bureau Department of the Interior Tokio.

Netherlands :

Wortmann, Ingenieur en chef, Directeur du Waterstaat, Haarlem.

CHIEF SECRETARY :

M. Kandiba, B.-W., Conseiller d'Etat, Professor of the « Instiitut des Ingénieurs des voies de communication » St. Petersburg.

ASSISTANT CHIEF SECRETARIES :

MM. Pistolkovs, E.-A., Ingénieur des voies de communication ; Tchekhovitch, P.-S., Professor of the Polytechnic Institution of Kieff.

SECRETARIES.

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MM. Rosing, Counsel of the Chamber of Commerce at Bremen. Volkmann, Regierungs and Geheimer Baurat.

Austria :

Roubik, Bauoberkommissär.
Macher, Ingénieur en chef.

Italy :

MM. Marzolo, Paul, Frigate Captain of the Royal Navy, Director of the Royal Hydrographical Department at Genoa.

France :

Lahaussais, Ingénieur des Ponts et Chaussées at Paris.

Russia :

Boerling, R.-L., Captain in the Imperial Navy.

Haesehus, E.-N., Ingénieur des voies de communication.

Hoiningen Hühne, B.-N., Ensign in the Imperial Navy.

Le Mercier, R.-L., Conseiller d'Etat.

Nikolski, A.-H., Ingénieur des voies de communication.

Nossovitch, T.-E., Ingénieur des voies de communication.

von der Raab Thielen, T.-L., Lieutenant in the Imperial Navy.

Spalving, H.-A., Ingénieur des voies de communication.

Verkhovtseff, J.-L., Ingénieur des voies de communication.

Stchouka, C.-V., Ingénieur des voies de communication.

SECOND SECTION

(Ocean Navigation.)

FIRST SESSION

Monday 1st. June, 1908 (Afternoon).

Messrs. DE ROUMMEL and DE SCHOKALSKY presiding.

Meeting commenced at 2.30 P. M.

Mr. PRESIDENT. — In the name of the Committee of Organisation, of my Russian Colleagues and of myself, allow me to offer you our heartiest welcome. By the presence of this large gathering of men of science and of the distinguished representatives of the different countries assembled here with the object of working together towards one common goal for the benefit of ocean navigation, I am sure that our work will be deserving of the task which we are about to undertake. His Excellency the Minister for Commerce and Industry has told you to-day that the Imperial Russian Ministry has done all that is possible to facilitate the members in their study of the harbours maritime works in Russia. You have or will receive an official copy of a volume giving a description of the Russian Harbours. Moreover in the Exhibition in the library you will be able to study the plans, models and maps of our maritime works.

Finally, I should draw your attention to the fact that an excursion will be organised after the Congress has terminated, to inspect the Harbours at Helsingfors, Riga, Windau and Libau. For this purpose the most comfortable and largest transatlantic steamboat the « Moscou » has been placed at the disposition of the members of the Congress.

For my part, Gentlemen, I can assure you that all my zeal and all my best efforts will not be lacking in conducting to a good result the discussions which we are about to commence, but I ask for

your kind cooperation and indulgence because I am not very familiar with the French language.

Before proceeding to the order of the day, I would ask your permission to read articles 16 and 17 of the revised Statutes of our Association which will be necessary to observe during the discussions, in order to avoid any misunderstanding during the course of debate.

The speakers will receive fly leaves on which they are asked to furnish us without delay, the subject matter of their discussion.

It is, gentlemen, with the firm belief that our work will produce fruitful results that I declare the first session of the second section of the XIth. Congress open. (*Applause.*)

Gentlemen, according to the agenda of the day we have to discuss to-day, the first question, namely : —

Fishery Harbours and Harbours of Refuge for the Coasting Trade.

Mr. GENERAL REPORTER. — The question, which we are going to discuss, is presented for the first time to an International Congress; it has been treated in four different reports, by Mr. Wilhelms (Germany), Messrs Bottemanne and Van Oordt (Netherlands), Mr. Silitch (Russia) and Mr. Carey (England).

The following is the résumé, I have to submit in my general report : —

If the reports are compared one with another, a great uniformity of views of the various authors on the subject of the question of the provision of Fishery Harbours and Harbours of Refuge is noticeable.

In Germany as well as in the Netherlands and Russia, the provision of harbours of refuge and fishery harbours contributes to the development of the fishing industry and of the coasting trade; from this fact, the great importance of such ports is recognised by the Governments of these countries, which subsidize them and materially aid enterprises which arise from the domain of industry.

The evolution produced in the fishing industry owing to the introduction of trawling nets and steamers, the rapid increase in the quantity of the fish caught and the development of the rail communication to insure the consignment of the fish fresh to the inland markets of consumption have called forth the necessity in Germany and Holland of enlarging the old fishery harbours and

of providing others, equipped in such a manner as corresponds to the exigencies of this industry.

The following classification can be accepted for the fishery harbours.

1. Fishery Harbours of local importance and Harbours of Refuge;
2. Large sea fishing ports.

In the Netherlands these latter are again subdivided with harbours for fresh fish and herrings.

The construction of the fishery harbours of local importance and of the Harbours of Refuge is subjected to practically the same conditions in the Netherlands, Germany and Russia. With the exception of quays and appliances for repairs, these harbours do not require any special plant. The more often they consist of a sheet of water, sheltered from the weather by moles or crib breakwaters of a light construction. The sheltered basin is deepened by dredging, and the draught regulated in accordance with the draught of the fishing vessels.

The harbours of Urk, Hela, Neukuhren, Haynasch, belong to this category.

In the Netherlands, it is not only coastal fishery harbours which serve as well as harbours of refuge for small craft, but also the large fishery harbours fulfil the same functions.

Thus in the plans for the establishment of new fishing harbours it will be found that the projected basins have now a much larger areas on account of their being at the same time harbours of refuge.

If the large number of small fishing harbours or harbours of refuge on the coasts of the Netherlands and Germany is compared with those provided for the coasting trade along the Russian Baltic coast, it has to be unfortunately confessed that very little has been done just in this direction in Russia.

The fishing industry is still very little developed on the Russian Baltic Coast, partly on account of the want of initiative of the inhabitants along the shores, the difficulty of raising loans and the lack of private capital, and partly, and more especially, on account of the unfavourable conditions of the coast navigation for the small coasting vessels.

On a length of 500 miles, between St. Petersburg and Polangen including the gulf of Riga, there are only 6 large harbours and only one harbour of refuge, Port of Haynasch, has been constructed in recent years. The fleet of sailing vessels navigating along this

coast attains, nevertheless, a figure of more than 800 hulls with a monetary value of 6,000,000 roubles (£ 640,000) and with a registered tonnage of 90,000 tons. These boats carry an annual traffic of 300,000 tons (1,000 kilos = 1 ton) from port to port. It must, nevertheless, be kept in view, considering the smallness of the development of the means of transport along the shores, that the transport of local produce in sailing vessels between the large harbours is the only one which really counts; under these conditions, the wish expressed in the report of Mr. Silitsch on the question of the distance between harbours of refuge, namely 40 miles at a maximum, seems a very modest one.

The Russian Ministry of Commerce and Industry has recently elaborated a general scheme for the construction of quite a series of harbours of refuge, foreseeing the provision of quays and the like in several cases; the realization of these works would require approximately an expenditure of 1.5 million roubles (£ 160,000)

In examining the large sea fishery harbours in the Netherlands and Germany, we find that all questions relative to the conditions which should be fulfilled at such ports, have been already elucidated.

The dispositions, carried out at the harbours of Ymuiden and at Geestemunde, and those for the projected harbour at Cuxhaven show clearly that the same principles have been applied in the equipment of the plant for these fishery harbours. A depth of 14 1/2 feet (4 m 40) to 20 feet (6 metres) allow the entry of steam fishing vessels. Special berthing quays and wide quays, equipped with rail connections have been established for the purposes of rapid unloading, sale and consignment of the fish. Separate quays have been provided for coaling the vessels, and for supplying food stuffs and the accessories of the fishing industry.

At the quays for unloading the fresh fish, auction halls for the sale of the fish, packing rooms let to the merchants, cold stores and administrative offices have been built. Finally in close proximity to these buildings there are goodsrailway stations for transport purposes.

A slight difference between the German and the Dutch fishery harbours exists in the distinction that has been made in the Netherlands in the case of the herring industry.

According to our opinion, in all large fishery harbours, such as that of Ymuiden or Geestemunde, the two classes of industry, that of herring and that of fresh fish, do not clash with one another

and we believe that it would be advisable in schemes for new harbours of this category to take full account of the requirements of these two kinds of merchandise.

It would be certainly difficult to adapt a herring fishery port such as Scheveningen into one for fresh fish, as the depth is insufficient for the navigation of steamers but it is not the case at Vlaardingen where the installation (experimental) of special stores for the sale and packing of fresh fish would, according to all probabilities, give beneficial results.

As regards the report of Mr. Carey, it is one of a very great interest. The author gives much useful information drawn from the practical knowledge he has acquired in the construction of harbours. He raises new questions which could be made the subject of special discussions at the Congress.

The five points mentioned in the conclusions of this author, all have their particular interest.

The question of an international system of day and night signals could be discussed in turn on the examination of the fourth question before the Congress.

The question of the relative advantages and disadvantages of dry docks and floating docks could be placed on discussion at the same time as the first communication which figures on the programme of the Congress, and which relates to the apparatus for raising vessels. The points 2, 3 and 4 of the said conclusions could be placed on the agenda of the next congress.

I have now come to the following conclusions, Gentlemen, which concern the question before us and have the honour of submitting them for your appreciation : —

1. All attempts tending to develop the fishing industry and to improve the conditions of coastal navigation are of great and economic importance. Among the steps to be taken, one of them refers to the establishment of harbours of refuge, of fishery harbours, of local importance and of large sea fishery harbours.

2. The fishery harbours of local importance and the harbours of refuge should be created under conditions as favourable as possible; should be established in the proximity of the routes of the vessels, should above all be placed at all straits dangerous for navigation and should afford efficient draught. The access to the harbours should be easy and without danger to sailing vessels at all weathers both day and night. The installations of these ports do not require special plant.

3. The sea fishery ports should provide for the rapid unloading for fresh fish, its sale by auction, its packing, its preservation, and its consignment by rail to the interior of the country. The quays should afford, to this effect, ample width for the erection of the necessary buildings and should be provided with rail communication. Special quays should be built for the coaling of steam fishing boats, and for supplying them with, food stuffs and other accessories of the fishing industry.

Above all, the sheltered area of water should be sufficiently large to afford an anchorage for vessels requiring refuge during period of bad weather.

The conclusions, formulated by the General reporter, were then read in German.

THE PRESIDENT. — Does anyone wish for an English translation?

I would then ask the authors, whether they wish to speak on the subject of their reports.

None of the authors wish to ; it is then for this section to decide whether the draft conclusions of Mr. de Roummel should be accepted.

Mr. VANDERLINDEN. — I would ask, Gentlemen, for your permission to bring to your notice several points in order that you may speak on the fishery harbours from a point of view more specialised.

We have all received the extremely interesting reports which treat on the question of the establishment of fishery harbours from the technical side. But this question should also be examined from another standpoint, which, it seems to me, does not lack interest, and therefore I will place the following question.

What are the conditions of success of a fishery harbour? According to my opinion, the way of replying to this question is approached as follows : — First of all, it is necessary that the harbours are well equipped, that they have easy access at all times of the tides and at all states of the weather if possible. Moreover it is necessary that these harbours include the necessary plant in order to carry on, under the most favourable conditions, all the manipulations required by the sale of the produce of the fishing industry. This is what I would call the technical side of the question.

But there is another condition which is of capital interest in the

assurance of the success of a harbour, and that is what I should call the social side of the question.

It is not sufficient to have equipped a harbour efficiently. It is necessary to have the means of using the equipment, that is the fishermen. Thus the practice of the calling of a fisherman exacts the combination of moral qualities of high value ; the fishermen must be manly, courageous, hardy, sober and moral. I have had occasion lately to visit some of the fishing ports, and I have arrived at the following facts that the indispensable conditions for the maintenance of the quality of the fishing population are generally realised there, where the fishermen succeed best in maintaining their habits, their particular mode of living and their peculiar character. Once the fishermen allow themselves to be drawn to the attractions of the town life, they are apt to lose those indispensable qualities which are required in the exercise of their calling. Then, on the contrary, where the fishermen form a kind of colony, living their own lives, they carry on their extremely arduous industry with success.

For example, Peterhead, the Scotch harbour. It is a large village of 20,000 inhabitants. The whole population lives on the fishing industry ; it is sober, hard working and moral. The use of alcohol is absolutely forbidden on land as well as on sea. The happiness and well-being are widely spread.

Another example, Scheveningen. The population of the fishermen is established alongside an important town, but it continues its simple life, preserving the customs, habits and its qualities. The fishermen are generally found to be in comfortable circumstances.

The contrary is happening at this moment at Aberdeen. The fishermen of Aberdeen lived in the country. Now, I do not know for what reason this population is being attracted to the city, and the surrounding villages are being completely deserted. I have been assured that this population has commenced to lose those qualities, which I must call necessary, in order to produce a fishing population. A degeneration, physical and moral, has been noticed.

I have had occasion to notice that the best conditions for fishermen are those away from civilised centres ; namely, living in the country and working at the same time to a certain extent as labourers. In connection with this point of view, I can quote the striking example of Lowestoft, a harbour of some importance. The fishing population does not live in Lowestoft, it has established an extremely prosperous colony at Kissingland. Every one has the

qualities of the fishermen and all the families-although they may be extremely numerous, 10 to 12 children are an average family, all the families are in circumstances which border on well-being.

Thus my observations have led me to the result that there is an advantage in establishing a fishery harbour, to insure its success, in a situation suitable for the maintenance of these intrinsic and necessary qualities. It is thus, that I arrive at the conclusion that, all things being equal, preference should be given to the establishment of a fishery port at that point where there is the best chance of its being utilised by a population, suited to exercise the calling of fishermen.

I would ask you to observe, that the question, I am treating, does not always present itself in the abstract; it is at this moment a prominent one in my country, in Belgium. We have a fishery harbour, which has been in existence for a long time : Ostend, and it does not prosper. The produce of the fishery amounts to 5 million francs (£ 200,000) while we see next to us the port of Ymuiden, after 10 years doing a business of double the amount. We are confronted with the question whether it would not be wise to establish a fishery harbour, where there is a population absolutely suited to that calling.

Following up these ideas I have the honour of submitting to the section, the following resolution : —

« In choosing a site for a fishery harbour, it is advisable to take into account the probabilities of finding in the immediate neighbourhood a population, possessing the qualities required for the pursuit of the fishing industry, and eventually providing such installations as will facilitate the maintenance of these conditions. »

In order to justify the last portion of the resolution, I have still to call your attention to certain secondary installations which have been carried out in some harbours. Notably at Geestemunde, a port entirely constructed by the Prussian Government, a « Seemannsheim » (Home for Sailors) has been built, i. e. a house for the fishermen where they can, if necessary, find lodging, obtain employment, bank their money, acquire information, etc. They are also provided with healthy distractions and religious instruction. According to the information, supplied to me by the Board of this Institution, there are weekly religious classes which are being followed with a some success. And it is a similar order of things, I have in view, when I say in the second part of my reso-

lution that it is advisable to provide secondary installations in order to preserve the desired moral qualities in the fishing population.

Mr. WORTMAN. — Mr. Vanderlinden has made some correct observations. In order to create a fishery harbour it is necessary to have a population of fishermen, and generally, it is at the places where this population lives, that fishery harbours should be established. But he quoted as an example the harbour of Ymuiden. Messrs. Bottemanne and van Oordt, who have reported on that harbour are not present, but I know the installations they have described.

Ymuiden is a very interesting case of a port created before the existence of a fishing population. This port was constructed 30 years ago in order to serve as an entrance port of the canal from Amsterdam to the North Sea. It was only after its establishment that the fishermen came there from the islands of the Zuyder See to unload the produce of their industry, and it was then, that the Dutch Government began the equipment of the fishery harbour, its regular organisation and the construction of the fish market. Now the port is used by the fishermen from the Islands and the surrounding localities.

Mr. VANDERLINDEN. — They continue, for the most part, to live on the islands.

Mr. WORTMAN. — They come to Ymuiden on their way to fish in the North Sea, but there is also the whole population of the surrounding villages which has migrated to Ymuiden. I, therefore, believe that it is not indispensable, in creating a fishery harbour, to have a population of fishermen at the outset. In consequence, I consider that the resolution of Mr. Vanderlinden is worded in too general a manner.

At Scheveningen it was different. There a population of fishermen existed.

Mr. VANDERLINDEN. — It has maintained itself there, because, being very conservative in its traditions, it continued to live according to ancient customs.

M. WORTMAN. — It sought a port and the Government constructed one for the fishermen who were already established in the district. The two examples are quite different.

I believe, Gentlemen, that I should make yet another observation. We have discussed fishery harbours and harbours of refuge for the coasting trade. These are widely different matters. The former should be properly equipped because the work of the fishermen is not sufficient to maintain their prosperity. This is not the case for the latter which allow of very simple construction.

According to my opinion the harbour of refuge for the coasting trade should be distributed along the coast as regularly as possible, in order to allow small boats to take refuge for a few hours. The fishery harbours on the other hand should be established at points near the fishing localities. It would be advisable to separate clearly the former from the latter in formulating resolutions.

THE GENERAL REPORTER expresses the opinion that it is not necessary to establish fishery ports, even where suitable inhabitants are to be found for the fishery industry. He recalls the example of Ymuiden quoted by M. Wortman and thinks that the same case can occur elsewhere.

M. VANDERLINDEN. — I shall be extremely brief in order not to abuse your patience. I believe that the divergence of opinion between M. Wortman and myself are more apparent than real, at least in regard to the examples he has quoted. The Dutch Government has created a complete harbour at Ymuiden, and they have been successful, for its commerce rose in five years to 10 millions francs (£ 400,000) whereas at Ostende the traffic has only risen to 5,000,000 francs (£ 200,000) after 50 years of use.

But who use the port of Ymuiden? Are they the inhabitants of Ymuiden? Only the captains live there, at least as a general rule. This is required by the ship owners in order to have them under control. The greatest proportion of the fishing population inhabits the neighbouring islands and continues to live there. Thus Ymuiden is still only a village. This example confirms my theory, and does not contradict it.

Second example, Scheveningen — The fishing population existed before the harbour and kept itself well apart from the watering place of Scheveningen and from the capital of the Netherlands. It keeps up its habits and customs, and thanks to this, it still possesses the moral qualities requisite for exercising the arduous calling of fishermen.

Do you wish, Gentlemen for an argument more in favour of my theory? I will tell you what happens at Kissingland. I have told you that the population is extremely prosperous and that the families are numerous. A large number of the fishermen have become boat owners. At 40 years of age, they are well to do ; at 50 years of age they become rich. They have numerous children. You will understand that, here many of these honest folk, having the responsibility of a large family, push some of their children on towards a liberal career and send them to College. Not infrequently these young people, after leaving college, ask their parents for permission to go to sea and to carry on the paternal calling. The recruiting of the fishing personnel is thus ensured for a long time. This is an additional argument in favour of my theory.

THE PRESIDENT. — Are there any other members who wish to have the text of the resolutions proposed by the General Reporter changed? Or does the assembly accept the wording proposed by the General Reporter.

THE GENERAL REPORTER remarks that his wording might embrace the unanimous vote, if the words drafted by Mr. Vanderlinden were incorporated in it.

Mr. WORTMAN suggested the addition : — « It is desirable to distribute the harbours of refuge for coasting trade as regularly as possible along the coast, local conditions permitting ».

Mr. le Baron QUINETTE DE ROCHEMONT. — It seems to me, Gentlemen, that the proposition just made cannot be accepted. Harbours of refuge cannot be distributed in a regular manner ; they are placed, where they are necessary. It is therefore difficult to accept this proposition and to say that ports for the coasting trade should be created in a regular fashion. Moreover, the necessity of a very large number of ports for coasting trade does not exist ; and I do not know of many harbours of refuge especially constructed for that purpose.

The proposition of Mr. Wortman was not accepted by the assembly.

THE PRESIDENT. — Mr. Vanderlinden do you accept, in accordance with the proposal of Mr. Roummel, the simple addition of the

following paragraph, the text of which is proposed by Mr. Kleine, Vice-President.

« It is obvious that the selection of the position of shelter and fishing ports will depend upon the local conditions of navigation for each country or district, and particularly on the stability and possible development of the fishing population. »

Mr. VANDERLINDEN gives his assent.

THE PRESIDENT. — There are no objections?

Under these circumstances I put the following resolutions for approbation to the meeting.

« 1. The development of the fishery industry and the improvement of coast navigation conditions are of great general interest:

» They demand the establishment of Harbours of Refuge, Fishing ports of local importance, and large ports for sea fishing ».

» 2. Harbours of refuge for the coast trade should not be too costly, be placed in proximity to trade routes and afford safe anchorage. The access to these ports should be easy and safe for sailing vessels in all weathers, day and night. Such ports require no special equipment;

» 3. The sea fishing ports should afford facilities for unloading the fresh fish as quickly as possible, for its sale by auction, its packing, salting and forwarding inland by rail. With a view to this, the quay should be sufficiently wide for the erection of the necessary installations and for railway communication. Special quays should be reserved for berthing steam boats to be loaded with coal, provisions and fishing tackle;

» The area of the water surface should be sufficient to afford anchorage not only to fishing boats, but also to ships which are driven to seek shelter in bad weather.

» It is obvious that the selection of the position of shelter and fishing ports will depend on the local conditions of navigation for each country or district, and particularly on the stability and possible development of the fishing population.

» For these different motives, detailed studies of sea coasts are indispensable. »

The conclusions were adopted.

The meeting adjourned at 4.30 P. M.

SECOND SECTION
(Ocean Navigation)

SECOND SESSION

Wednesday 3rd June, 1908 (morning)

President : Mr. DE ROUMMEL

The second session opened at 9.30 a. m.

THE PRESIDENT. — We pass on to the examination of the second question, namely.

*Inland sea ports and their means of access, their advantages.
Economic and Technical Study.*

Mr. de Szystowski acting as General Reporter spoke.

THE GENERAL REPORTER summarised the reports presented by Messrs. Hunter, Orlando, Vidal, Grenier and de Smet de Naeyer, Giroukhine, de Timonoff and Jaba. He read the conclusions of the different authors and called attention to the fact that there existed no divergence of opinion between the authors.

Under these circumstances, the General Reporter said it sufficed to condense the opinions expressed by the authors into the following conclusions : —

1. The inland maritime harbours may be looked upon as forming the doors of communication between the sea and the districts (Hinterland) served by them (Mr. Hunter);
2. They lend themselves to the service of the great lines of navigation only if these use them as their starting points, and they do not in general serve as ports of call for long voyage trade or even for great coasting trade liners (Mr. Vidal);
3. They provide commerce with considerable economic advantages for the exportation and importation of large quantities of

bulk goods at the lowest possible rates of freight, provided their approaches be always free and easily traversed (Mr. Vidal);

4. In order to maintain the commercial and economic character which they have already acquired and to secure the possibility of their further development, the inland maritime harbours should in every state of the sea keep their approaches and their basins at a depth corresponding with the needs of the different types of vessel, which steadily increase in size; their traffic should be impeded as little as possible by bridges and locks, and their ground should be large enough in area to admit of the warehousing of heavy and cumbersome merchandise being as easy and as little burdensome as possible. The construction of fixed bridges over the entrance channels should be avoided, and the attempt should be made to replace these by tunnels or by movable sections which, as regards size, both in the breadth and in the depth directions give every reasonable guarantee of being able to meet the present and future requirements of navigation (Mr. de Smet de Naeyer, Mr. Grenier, and Mr. de Timonoff);

5. The development of inland navigable ways should be favoured by the provision of the best possible mooring facilities, so that maritime shipping may be enabled to penetrate as far as possible into the country and to reach the industrial and agricultural districts (Mr. de Timonoff and Mr. Hunter);

6. The study of projects for inland maritime waterways must not be limited to the sole consideration of actual commercial and industrial necessities; there is still room for consideration of the general effects, of an economical no less than of a political or social kind, which the new elements of progress may exercise on the internal conditions of the country and on its relations with foreign lands (Mr. Orlando and Mr. Timonoff).

These conclusions were read in the German and English languages.

THE GENERAL REPORTER. — After the manuscript of my report had been sent to Brussels to be printed under the auspices of the Permanent Commission of the Navigation Congresses, I received further the reports of Messrs. Ed. Suling and J. Rösing on this question which now interests us.

The authors of this report describe more especially the inland sea ports of Königsberg, Stettin, Lübeck, Hamburg and Bremen, comparing the freight by sea with those by inland waterways, and

taking into consideration the expenditure required to equip and maintain the ports. They arrive at the conclusion that is not possible to determine fixed rules for the advantages of inland seaports, and that in each particular case it is necessary to examine, if, from the economic standpoint, it would not be better instead of pushing seaports inland to improve the inland waterways communicating with sea board ports.

In consideration of very correct conclusion of Messrs. Suling and Rösing and that the same has not been precisely formulated by any other the authors, I find it indispensable to complete point 5 of my general report by the following addition :—

« If the economic and technical condition are not favourable for such an undertaking, it is necessary to improve the inland waterways and try to augment their useful carrying capacity. »

THE PRESIDENT invited the various authors to address the meeting on the subject of their reports.

None of the authors desired to speak.

Mr. VANDERLINDEN. — The advantages of inland sea ports, in order of precedence, are as follows : — First, these harbours are inland of those which serve an important market. This is clearly one often essential reasons of their success. In the second place, it is often possible to construct at these ports, ports of call, deep footed quays where the draught is of such a depth that it is possible without any loss of time, to handle the merchandise at once. Lastly, the third advantage arises from the fact that they are situated inland and are served by a developed railway and waterway system. At such ports the intercommunication of maritime and inland navigation is realised.

I need not lay weight on the importance of this from the economic point of view. Such ports as Hamburg, Rotterdam and Antwerp clearly owe part of their success to the fact that they incorporate the three conditions which I have just enumerated. And if Marseilles, a port of first order, has remained for a considerable period of time stationary, I think it is due to the fact that this port does not incorporate these desired conditions, namely, the combination of maritime and inland navigation. Thus the French Government think of building a canal at great financial sacrifice in order to realise these advantageous conditions. But when a port is situated along the banks of a large river, it seems to me that the

whole interest attached to make this port, a port of call, is to construct the quays with the maximum draught possible which the river itself permits.

Several authors have already noted this point. There is a marked tendency to the increase in draught of sea going vessels. The sea port, whether it be along the sea coast or on the banks of an upland river, which can offer a maximum draught a few years hence, will develop its traffic more rapidly than the rest. The conclusions which I should wish to submit for the approbation of the Congress are as follows : —

« In view of the ever-increasing draught of sea going vessels, it is right to study the improvement works for the rivers, on the banks of which maritime ports are situated, from the point of view that, along the quay walls, the maximum possible draught permissible by the natural conditions of the flow of the rivers should be attained. »

You will tell me; it is obvious. Nevertheless in certain cases the problem has been differently treated. It is said *a priori* « We must have a draught of 8 metres (26 1/4 feet) » and it has been neglected to examine whether the river could not offer a draught of 10 metres (33 feet). In such cases a mistake is made.

THE GENERAL REPORTER. — This observation is in perfect accordance with the report of Mr. Hunter. I express the opinion that this addition should be accepted by this section.

Mr. MENDES GUERREIRO remarked that the General Reporter has believed it his duty to limit the conclusions he has just proposed. On the contrary it is his opinion that the conclusion as printed would be preferable. He quotes as examples, the harbours of Bremen and Hamburg, as well as that of Lisbon. This latter port has a draught of 10 metres (33 feet) and a very considerable traffic. He insists, although the conclusions point in a precise manner, that inland sea ports should be improved to admit of large vessels. He asks, therefore, that the section should not vote for additions to the text of the conclusions or on conditions which might restrict this general tendency.

Mr. GRENIER. — Mr. Vanderlinden proposes to complement the conclusions by saying that is necessary to provide in the river along the quay walls as great a draught as the river permits.

It appears to me that in the terms in which this is expressed, the proposition does not at all adequately cover the question from the point of view that it treats with a river under consideration and not from the point of view of the examination of the general conditions of an inland port. The general reporter has associated himself with this manner of looking at the question. He has indicated 8 metres (26 1/2 feet) as a suitable draught for inland harbours.

The adoption of the proposal of Mr. Vanderlinden would lead us to this situation that the draught might be either insufficient or too great.

We consider that there must be necessarily a fixed draught in order to establish a useful inland harbour for the world's commerce. To go thus far would not respond to the object in view and to go beyond would be to create an inland port for the purpose of large liners. Thus, as Mr. Vidal has already said, the inland ports do not always lend themselves for such purposes.

We therefore propose to hold to the very elastic proposition of the General Reporter.

Mr. BORMANN. — I feel that I should call special attention, of all the reports which are being discussed to-day, to that of Mr. Jaba relating to the navigation conditions in Siberia, and in this respect to point clearly to the conclusions of the author :

1. The route on the mouths of the great Siberian rivers, the Obi and Jenessey should be considered, according to the knowledge acquired, as absolutely without danger, although the approach may be only possible for a very short period of the year sometimes not more than 8 weeks ;

2. The Obi and the Jenessey, on enormous reaches, at least 1,000 kilometres (620 miles) can be ascended by sea-going vessels of great draught ;

3. The insignificant traffic of the railways indicates that the ultimate development of the country depends absolutely on the navigation of the Obi and Jenessey ;

4. The ultimate development of this immense country with its immeasurable resources in minerals and other raw products depends on the use of the sea route ;

5. We owe the vigorous impulse which has been given to the important problem of the adaptation of the rivers of Siberia and the Arctic Ocean for navigation purposes to Prince Khilkof who

has based his enterprise on the practical exploitation of the possibility of the navigation in the estuaries of the Obi and Jenessey on the careful scientific explorations of Professor Wilkitsky.

I ask the assembly to accord particular attention to the report of Mr. Jaba and accept the resolutions aforementioned.

THE PRESIDENT. — Allow me to remark, that the communication, although of great interest, to which Mr. Bormann refers, has altogether a special character, which arises out of our programme, and is one which cannot alter consequently the conclusions presented by the General Reporter and the other authors.

M. VEDEL (in English). — In reading the different reports, one is struck with the different views taken by the authors as to what is understood by inland ports. It seems as if a sharp definition of the meaning of this word is lacking. If taken in the wider sense of the word as ports for the distribution of goods entered, and collection of goods to be exported, I will, with your permission venture a few remarks in support of the opinion expressed by some of the authors, i. e., that dredging a deep channel or building a deep canal to an interior port, even if at first sight the expense seems considerable, will in the long run prove economical.

The history told by Mr. Giroukhine of the birth, growth and decline of the lighterage between an interior port at a river some distance from the sea and its outer port, where the ocean going steamers unload and take new cargo, has been retold under somewhat similar circumstances in places where the question was not of inner ports — in a narrower sense of that word — and outer ports but rather of outer ports of more or less importance. A small country with a long shore line, such as Denmark, will naturally begin by having a number of minor ports with limited depths of water intended for the distribution of goods and one or a few first class ports with accommodation for the oceangoing vessels. Not many years ago only one or two of Denmark's 160 harbours were able to satisfy the ever growing demands of modern shipping as to depth of water, etc. A traffic of lighters sprung up for carrying goods to the provincial harbours from Copenhagen, where a free-port provided with all modern appliances had been opened in 1892, and to some extent — from Hamburg.

Seagoing lighters of 150-700 tons register, towed single or in couples, appeared in the harbours in increasing numbers, until

about 1903 a maximum was reached. At that time it had been realised that economically it is preferable to incur the expenses necessary to receive the cargoes directly, and the provincial harbours were consequently being deepened and improved.

Hence the lighterage has dwindled down to its former insignificance, all goods in bulk being carried to the ports directly by the oceangoing steamers, even though these may ply at two, three or more ports, when the cargoes are divided, and only general merchandise being to some extent — in full accord with Mr. Vidal's distinction — trans-shipped in the capital port from the regular liners plying there only.

I believe, and I have found by calculations in a general way, that a careful consideration will in a great many cases prove of the economy of deepening and improving harbours to receive ocean tramps with bulk cargoes.

Mr. NYHLEN (in German). — I have had previous occasion to watch the sea expedition to the Obi and the Jenessey organised by the Russian Government. I think it is my duty to observe that it was not on behalf of large steamers but for the light boats of the inland navigation type of a slightly stronger structure which have made the journey via the North Cape to the Jenessey without danger. Meanwhile, the crossing of Europe to that district is, for the present, still neither very practical or cheap, because the return freights are wholly wanting, and in consequence the freight charges are rather high. As raw materials are not failing in Siberia, this state of affairs can change in the next ten or twelve years.

An inland navigation on the Jenessey into Europe cannot be organised owing to the high chains of mountains which cross the route. There only remains the sea route which is open 6 to 8 weeks. This suffices for a journey there and back.

From the commercial point of view, one is obliged to resort to means to carry on the transport of the goods at such low freights that they can be brought into the Siberian market at feasible prices. That will be only possible when the existing raw materials can be brought to Europe as return freights. The lighter sea going vessels also penetrate into the interior of the country because the Obi and the Jenessey are very navigable. There are moreover excellent maps.

Mr. VANDERLINDEN. — I would ask permission to reply in a few words to my honoured friend Mr. Grenier.

If I have rightly understood, the first argument presented by Mr. Grenier is that the conclusion which I offered, does not adequately correspond to the study of inland ports. Meanwhile, it seems to me that, if there is an important factor on which the success of an inland port depends, it is on the draught which can be accorded to it. Thus the improvement of the river, which flows to the port, is a factor on which the prosperity of the port depends.

Mr. Grenier tells us that, if the study of the improvement works of the river flowing to the port is the basis of the maxima conditions which can be offered by nature, there is a possibility of too small or too great a draught. I do not know if in practice it is possible to afford a natural approach to harbour greater than that which it naturally has. I will understand that it is possible to improve the approach. We have seen this in the Works on the Tyne and Clyde, but what the conclusions placed before the Section cover, is that it is necessary to study, for the works of improvement in such a manner, that the draught of the approaches should be as deep as possible.

But this result once attained, may it not be necessary to organise systematically the dredging along lengths of 50, 60 or 100 kilometres (30, 40 or 60 milès) in order to arrive at depths of 2 to 3 metres (6 1/2 to 10 feet) more than the natural conditions of the river permit? I do not believe that this is practically possible.

Mr. Grenier tells us also that working in accordance with my conclusions, it would be possible to arrive at too great a draught. This, I must absolutely contradict. Why? A too great a draught would be achieved when all the world is of one opinion in saying that the prosperity of harbours depends on the depths of their draught! I have only in view, the large seaports and the future is for those who can offer the greatest draught. All the world is of one opinion on this, I repeat this : it is an error to say that a draught of 8 metres (26 1/4 feet) is sufficient. 8 metres (26 1/4 feet) is far too little for those ports which aspire to become the principal ports of the world. There is nothing to prove that the draught of ocean vessels will not attain 10 metres (33 feet) or even 11 metres (36 feet). On different occasions, at previous congresses, we have been asked to discuss the improvement works of harbours in regard to the augmentation of draught of vessels. I must fight the argument of Mr. Grenier in a most decisive manner. This is all I have

to reply to as regards this observation. But in order to define more precisely my ideas, although my conclusions refer to every port along a tidal rival, I would ask permission to add the four words « of the first order » to the conclusion I have put forward.

These conclusions will be then as follows : —

« In view of the ever increasing draught of sea-going vessels, it is right to study these improvement works for rivers on the banks of which maritime ports of *the first order* are situated from such a point of view that along the quay walls the maximum possible draught permissible by natural conditions of the flow of the rivers should be attained. »

Mr. TROOST remarks in reference to words « natural conditions » which are in the text proposed by Mr. Vanderlinden. It is to be understood by these words, the depths which can be maintained after the works of improvement by the action of natural forces?

Mr. VANDERLINDEN. — Yes, I mean that.

THE PRESIDENT interrupts the discussion and gives the word to Mr. de Timonoff, President of the Commission of Organisation of the Congress who read before the assembly standing, the French translation of a telegram addressed to the Congress by H. I. H. the Grand Duke Michel Alexandrovitch :

« I am happy to forward to members of the Congress, the following telegram received to-day from H. I. M. the Emperor » :

« I request your Royal Highness to transmit to the Members of » the XIth. International Congress of Navigation my profound » thanks for the wishes they express. I wish them with all my » heart full success in the solution of the questions which concern » so closely the welfare of the countries they represent.

(*Applause*).

» (S.) MICHEL. »

THE PRESIDENT, on re-opening the discussion of the second question called on Mr. Rösing.

Mr. J. RÖSING (in German). — If I have properly understood, one of the speakers, who has preceded me, desires that only the printed conclusions of the General Reporter should be put forward

but not the amendment which he proposed to-day to add in conformity with the report presented on behalf of Germany by Mr. Suling and myself. This amendment refers to the recommendation for the construction and enlargement of an inland port only, provided that the results of calculation in each particular case, will prove of utility of the works.

This amendment is absolutely necessary in order to give a practical line of direction to the resolutions of the Congress. The enlargement of the Ports of Bremen and Hamburg have been given us as examples : certainly we are forced to make these harbours as serviceable as possible for ocean navigation : but without taking into account that we have also enlarged the basins at Bremerhaven for the largest transatlantic liners, the conditions at Bremen and Hamburg are such examples that do not permit of generalisation. It is this object that our German report had in view. The historical development of a port depends always on the local circumstances and also to a great extent on the nature of its communications by water with the Hinterland (inland).

The International Congress should, however, follow practical objects. The Reporters, at the Congresses held in Vienna and Frankfort, on these questions analogous to those of to-day, were obliged to formulate general conclusions which would with utility satisfy the point of view of the penetration of sea-going vessels to the interior of a country. This did not succeed, and we wished, basing our opinion on the fresh experience, to put forward to the Congress, a recognition of the impossibility of general formula of practical utility. However, we admit willingly that the conclusions proposed by the General Reporter, in conformity with the interesting individual reports, served as a subject for a resolution, but only with the limitation previously indicated. Without this the resolution would be of no practical value.

Mr. CRAHAY DE FRANCHIMONT. — I do not wish to take up much of your attention. I wish to ask only for permission to say a few words on the subject of the conclusions proposed by Mr. Vanderlinden and with which I am entirely in sympathy. There is, nevertheless, a slight modification in form which I wish to suggest.

Mr. Vanderlinden has told you that it was desirable, when a river flowing past an inland port is improved, to make this river of the greatest possible value compatible with the natural conditions of the river. I should like to use a different expression for the words

« natural conditions » and one which has been frequently used at the Navigation Congresses on the occasion of similar discussions. The words are « hydraulic force of the river ». The natural conditions of the river may be excessively bad and its hydraulic force can be excellent. There are examples of this nearly everywhere. What was the river at Bremen like before the improvements which were carried out by our lamented colleague M. Franzius? Considerable improvements have been realised there, the success of which was due to the use of the latent hydraulic force of the river. I hope that Mr. Vanderlinden will be willing to accept the substitution of the words « hydraulic force » instead of « natural conditions » in the wording of his conclusion.

MR. VANDERLINDEN. — I absolutely agree with Mr. Crahay de Franchimont.

MR. DE JOLY. — The question is complex. Mr. de Franchimont has just explained that he only differs from the conclusions of Mr. Vanderlinden in a few words and Mr. Vanderlinden from those of Mr. Grenier in four words. This shows that a slight re-editing on the text can be of great weight in this question. I think I should recall that it was decided, when conclusions are too developed, not to approve of them at the session in sitting. I ask permission to suggest to the section that the vote on the conclusions should be reported at a later meeting and that the conclusions should be submitted to a sub commission of three or four delegates representing the different languages, to draw up the text, taking into consideration the value of the words and the expressions of opinions which have been put forward here.

We are not completely unanimous as to the definition of an inland port. Mr. Grenier holds the view of a port served by a canal : Mr. Vanderlinden, that served by a river : Mr. Guerreiro has mentioned Lisbon, which from our point of view is not an inland port. I consider Lisbon as practically a seaboard port. I suggest to vote for a formula which will cover the whole discussion. As the discussions of the Congress can have a great practical importance, I propose the nomination of a Committee in which, of course, the General Reporter will take part, and which will prepare a text taking into consideration all the opinions expressed here.

THE PRESIDENT. — I agree. It will be useful to re-edit the text of the conclusions by a sub-committee, and I propose to adjourn the session for half an hour. If those members who have taken part in the discussion will pass into the President's room for the Second section, they may be able to come to some agreement on this matter.

The meeting was adjourned at 11.30 a. m.

* * *

The sub-committee, consisting of MM. Troost, President, Crahay de Franchimont, Grenier, Mendès Guerriero, Rösing, de Szystowsky, Vanderlinden and de Joly, Secretary, formulated the conclusions concerning the second question in the following terms.

« 1. Inland maritime ports are generally more suited to the service of great navigation lines when the latter have their home port there; they are seldom suitable as ports of call.

» To preserve and develop the commercial and economic character of inland ports it is desirable to guarantee to their approaches and their works such depths as shall be largely sufficient for the future, while keeping financial possibilities in view;

» 2. When the inland port is situated on a river, the depths ought, if possible, to reach the maximum consistent with the hydraulic power of the latter.

» The approaches to inland ports should, in principle, be free of obstacles such as bridges or locks of which the number should be reduced to a minimum;

» 3. At the time of the establishment of an inland sea port, it is better to place it as far as possible in the interior, so as to bring it near the industrial and agricultural centres while keeping in view the economic and social conditions of the country passed through.

» If the harbour must remain far from the heart of this country, it is well to make it the terminus of a system of completed inland navigation lines. »

These conclusions, which were read during the afternoon session, were adopted by the Second Section.

SECOND SECTION
(Ocean Navigation)

THIRD SESSION

Wednesday, 3rd June 1908 (Afternoon)

President MR. DE ROUMMEL.

The meeting commenced at 1.15 p. m.

THE PRESIDENT. — We are now going to examine the third question.

Construction of Harbours on a Sandy Shore.

Among the authors who have occupied themselves with this question, we see the name of one of our most eminent colleagues Mr. Vernon-Harcourt. Merciless fate has deprived us of this excellent man. As a mark of homage and respect to his memory, I would ask you, Gentlemen, to rise from your seats with us (*The members rise.*)

THE PRESIDENT. — I now call upon the General Reporter, Mr. Brandt.

THE GENERAL REPORTER — The question of the construction of harbours on sandy shores has been made the subject of several reports presented by :

Mr. Wortmann (Netherlands);
The late Mr. Vernon-Harcourt (England);
Mr. Lo Gatto (Italy);
Mr. Sanford (United States);
Mr. Ivanina and Aekerlé (Russia)

I would read to you, Gentlemen, the conclusions to which I have come by the examination of these reports. The conclusions agree almost entirely with those which have been formulated by Mr. Vernon-Harcourt.

They are : —

1. Access from the sea to *ports on lagoons situated in tidal seas* can be assured by building a pair of jetties in the main channel of the lagoon; the flood currents towards the lagoon and the ebb currents towards the sea suffice generally to carry away the sand which forms in front of the heads of the jetties; resort to dredging should only be had as an auxiliary means. All measures which may assist in increasing the effects of tidal currents in cutting away the bar should be taken at lagoon ports; the tendency of these measures should be to increase the volume of water in the lagoon and to close the side entrances;

2. The best way to preserve *the entrance to a lagoon port on a non-tidal sea*, an inland port at the mouth of a river or canal, or a port dug in the shore, with its entrance protected by a pair of parallel jetties not far apart from one another, against deposits of sand, is to prolong the jetties to that depth where the most violent disturbance of the water will have no effect on the bottom of the sea. The action of the current of a river or of a channel of the lagoon cannot be depended on to maintain the depth near such a port; the only resort then is to powerful self-propelled suction dredgers which are able to work in the swell on the bar which forms in front of the heads of the jetties.

The construction of pairs of parallel jetties cannot be recommended for new ports to be established *unless they be lagoon ports on tidal seas*; this type of port would always have the great defect of a lack of anchorage ground. In the matter of accumulation of sand, ports with parallel jetties near together possess no advantage over those whose jetties are placed a certain distance apart so as to obtain anchorage ground of a certain area;

3. When ports are made on a sandy shore by means of *outside works sheltering a large anchorage ground*, the defence may consist either of *two jetties* quite far apart and continued to the shore, or of a *breakwater* either not connected with the shore or else connected therewith by an open jetty.

The first of these two modes of construction is the one which has been more used at the present time; its results are fairly good in

seas where the quantity of sand travelling along the shore is not very great.

The jetties should be carried out, in all cases, to the greatest possible depth, where a great disturbance of the sea has no action on the bottom. These works, and especially those which protect the port on the side whence comes the sand, should be inclined to the shore in order to facilitate the passage of a portion of the alluvia from the port. But, even though jetties of great length be used, sand always accumulates at the entrance to these ports and the accumulation of sand must be combatted with by the use of powerful self-propelled suction dredgers able to work in a swell.

The second way of obtaining a port, which includes the construction of breakwaters, has not yet been sufficiently applied to enable a judgment to be formed as to its superiority over or inferiority to the first, and to pronounce on point of knowledge whether it is easier to keep down the alluvia deposited between the shore and the breakwater with the dredger, than it is to control those alluvia which are deposited in the open sea in front of the entrances to ports of the preceding type, formed by jetties connected directly to the shore.

According to all appearances, the adoption of breakwaters may be recommended when the quantity of sand travelling along the shore is large. Breakwaters should be extended as far from shore as possible. In the case of isolated breakwaters, and especially in that of breakwaters connected with the shore by means of an open jetty, the deposits of sand formed in the sheltered space will be able to be removed, under the protection of the breakwater, by means of bucket dredgers.

In comparing these conclusions with these of Mr. Vernon-Harcourt, it will be found that they are almost identical with those of that author (above all, as regards the first part which refers to lagoon ports).

I have the honour to submit, Gentlemen, these conclusions to your kind consideration.

Mr. WORTMANN remarks in reference to the Port of Ymuiden which he treated in his paper, that this port is an interesting example in support of the second conclusion of Mr. Vernon-Harcourt, and which the General Reporter has chosen to a certain extent as a model for his conclusions.

This port was constructed 30 years ago with a draught of

7.50 metres (24 1/2 feet) and the jetties were extended out to sea until a depth of 8.50 metres (28 feet) was reached. In order to comply to the growing needs of the seagoing navigation, the depth was lately increased to 9 metres (29 1/2 feet) and even latterly to 10.5 metres (34 feet) or to 10 metres (33 feet below the ordinary low tide line).

At the same time, a channel beyond the jetties has been dredged with a width of 230 metres (755 feet) and with a depth of 10 metres (33 feet) at low water. This approach channel has been maintained by dredging, and at Ymuiden that, which Mr. Vernon-Harcourt recommends on his second conclusion, namely of dredging a channel to the depth of 12 metres (39 1/2 feet) and also of dredging a certain area to this depth to the North of the channel in order to form a deposit basin for sand carried by the currents running S. W. to N. E. has been carried out.

In this manner, the maintenance of the access channel, and of a port with a depth of 10.50 metres (34 feet) for the greater part of the year, has been successful. There is, only 2 to 3 months on an average during which the depth decreases to 10 metres (33 feet) which in itself is sufficient for the navigation.

Mr. GERMELMANN (in German). The question of the means to be employed to maintain the access to ports has in the course of the last 10 years, undergone an important change. Fifteen years ago the construction of moles was still considered the only means to maintain a free approach to the ports; to-day the dredging is considered as an efficacious procedure, perhaps as the best means of ensuring the free entrance. According to my opinion, this should be formally expressed in the resolutions. I am in agreement with conclusions of Mr. Vernon-Harcourt as well as those of the General Reporter, but I would ask whether the resolution should not have a little more regard to the importance of dredgers.

THE GENERAL REPORTER suggests to add a fourth paragraph to his conclusions saying that, in any case, recourse can be made to dredgers.

Mr. VEDEL (in English). — If you will allow me, I will make a few remarks on the report of our lamented Mr. Vernon-Harcourt, precisely because the resolutions proposed are based on his work.

The opinion expressed by Mr. Vernon-Harcourt in conclusion : —

On a coast the shores of which have a slight slope and where there is a current carrying the sand for a considerable distance from the beach, there is no reason to construct a closed harbour, This opinion, I say, is somewhat discouraging. There are, I believe, not a few among us who are working to solve this problem. It would therefore perhaps be more correct to be content to say that a generally satisfactory solution has not been found.

In another place the author remarks that detached breakwaters with or without viaduct connections with the shore, are the only works actually constructed on the principle which leaves a free passage for the movement of the sand between the works and the bottom.

Well, this is not exact. In Denmark along the coasts with moving sand, three little fishing harbours have been constructed with closed basins in the open sea. Each is connected with the mainland solely by an open viaduct. These veritable *harbour islands* (*ports îles*) exist, although they may be small, and contrary to the expectations of many engineers, they have been perfectly successful. It is a case of the old proverb *Ab esse ad posse valet consequentia* i. e. « what is, can be ». These harbours have been described at the Engineering Congress held some years ago at the Saint Louis Exhibition, and a description had been published in the Minutes of the Society of Civil Engineers of America.

It is difficult, not to say impossible, to predict what deposits will form on the leeward and windward sides of a new work constructed as a harbour island. But it seems, they follow a certain law, dependant on the tides, winds, and waves, on their direction, force and duration, and on the distance, between the works and the shore. It is for this reason that I should propose to add to the conclusion; that it is desirable for Engineers to study theoretically, but also as much as possible practically by actual observations, how these detached works, under determined conditions, give rise to the formation of deposits or accumulate moving material.

THE GENERAL REPORTER. — Mr. Vedel who has spoken of the coasts of Denmark, did not tell us if the harbours are joined to the mainland by such works as jetties, etc.

Mr. VEDEL. — They are joined by works with freeway.

THE GENERAL REPORTER. — But behind the jetties there must always form a sand bank, so that the existence of such a port, detached from the mainland and only joined by a free way jetty, must always demand the use of dredgers. This is provided for in the third conclusion I have proposed. I should add that I have not recommended the use of such ports, because they are not yet sufficiently widely used, although there are some good examples.

M. IGNAZIO INGLESE. — Attention should be drawn to the proposition referring to the construction of ports on sandy shores with the use of breakwaters, detached or continuous, with freeway. When the coast cuts into the sea, the isolated breakwater causes in the first place the deposit of sand within the harbour. In Italy there are a number of ports on sandy shores and nearly everywhere there we have proofs that such is the case. On the South coast of Sicily, the Port of Licata formed by an isolated mole and 2 moles detached from the coast has nearly silted up in a short time, and the continuous dredging is very expensive. A little distance away, the port of Porto Impedocle in an analogous situation, maintains itself very well. It is constructed with 2 moles, more or less like Ymuiden. On the coast of Calabria, in the Gulf of Sta. Eufemia, the harbour of Sta. Venere, constructed with an isolated mole, has had to be modified by joining the breakwaters by means of a solid mole to the shore.

THE PRESIDENT. — I would remark that there is only a small divergence of opinion and the General Reporter has consented to make an addition in his report in accordance with the remarks made by Mr. Vedel. I suppose therefore, Gentlemen, that the section will accept the conclusions of the General Reporter, complemented by a note referring to the necessity of having recourse to dredging.

The Section agrees to the conclusions formulated in the following manner.

1. The entrance to a harbour, situated on a lagoon opening into a sea, can be effected by means of parallel jetties built on the principal channel leading to the lagoon. The action of the tide is sometimes sufficient to insure the necessary depth of water over the bar which generally tends to form at the end of the jetties; but often the dredging must be used in addition.

The strength of the tidal currents in the channel leading to the

port should be increased by enlarging the capacity of the reservoir formed by the lagoon and by closing the secondary arms of this lagoon ;

2. Except in the case alluded to in the preceding paragraph, the maintenance of the depths can only be secured by means of dredging ;

3. As parallel jetties give no roadsteads and offer no special advantage from the point of view of maintaining depths, their use is only recommended in the case mentioned in the first paragraph above ;

4. Jetties, whether parallel or converging, must, to be of service, be prolonged to depths where the erosive action of the sea is no longer felt ;

5. Converging jetties must be strongly inclined towards the shore so as to offer no obstacle to the passage of alluvial deposits carried onward by the littoral currents ;

6. In case that the movement of materials along shore be very great, it is of advantage to have recourse to moles or breakwaters parallel to the coast, or even to place the port out in deep water and to connect it to the ground by means of open piers. In this case the moles or other works of entrance to the port should be as far from the shore as local circumstances permit.

THE PRESIDENT. — M. Hendel, a Russian Engineer, desires to make a communication. We have, however, not the time to discuss it but it will not be of failing interest to us.

This communication is entitled : —

*The Direction of the Current of the Amou Daria along its
ancient Bed Ouzboy.*

M. HENDEL treated his subject at length before the audience.

We give the following resumé of his communication : —

The River Amou Daria, according to historical data, had two arms : — The Western Ouzboy (Oxus Arsos, etc.) which flowed towards the Caspian Sea passing by the sweet water lake Sary-Camiche and the Eastern arm, Djeïkhouné (the present Amou Daria) which flowed and still flows towards the Sea of Aral. Near the mountains Cheikh Djeïly the waters disappeared below ground

and re-appeared later on the surface forming a fertile delta of several arms.

It was the rich oasis, well populated, the country of the Ouzboy. But in consequence of various circumstances, the Ouzboy dried up and the district became a desert.

On the 14th. Feb. 1716, Peter the Great issued an Ukaze to the Senate to divert the waters of the Amou Daria to the Ouzboy; unfortunately, it was not executed owing to the assassination of the leader of the expedition Prince Bekowitch Tcherasky.

The periodic floods of the river extend still sometimes their waters as far as the Lake Sary Camiche (the level of this dried-up lake is almost 4.50 metres (15 feet) above the level of the Caspian Sea.) The great flood of 1878 gave occasion to an organisation in 1879 of an expedition, entrusted by Imperial Command on to General Gloukhovskoy, to study the ancient beds of the Amou Daria.

The results obtained were published in 1895.

After this attempt, nothing has been done for nearly 30 years.

The power of this water supply for supplying the projected route is assured, for according to the data of Messrs. Smidt and Dorandt the flow of the river at Nuxus is 976 to 4,337 cubic metres (3,450 to 15,200 cubic feet.) The flow data of the Ministry *Des Voies de Communication* are only 850 to 4,300 cubic metres (3,000 to 15,000 cubic feet) that is to say, anyhow sufficient for a navigable canal and for the irrigation of 1,000,000 hectares (2,470,000 acres.)

As regards the nature of the river soil (loamy clay and loess) they must be considered as fertile according to the historical records referring to the lands of the oasis. It must not be lost sight of the fact that the mud of the Amou Daria, according to the chemical analysis, is of the same quality as that of the Nile and therefore equally fertile.

The economic state of the country offers peculiarities, notably as regards the cultivation of cotton.

The harvest of cotton was 1,820 kilos (4,000 lbs) and that of wheat 1,920 kilos (4,200 lbs), that is to say almost the same yield per hectare (1,600 and 1,740 lbs per acre) or it is permissible to say that in the case of importing wheat into the country, *each lb of wheat could be replaced by a lb of cotton.*

The results, obtained on this subject, are mentioned on page 415 of the *Revue de la Section Transcapienne* of 1896.

The urgent necessity of increasing the irrigations to favour the culture of cotton has been confirmed by the Hydraulic-Agricultural Department, which can only account for 600,000 hectares (1,500,000 acres) as ready for irrigation.

M. Hendel has made a project which would realise an uninterrupted waterway 7,500 kilometres in length (4,700 miles) from the Baltic Sea to the Afghan Frontier. It would include a mixed waterway (navigation and irrigation) of 1,200 kilometres in length (750 miles), ending at the Gulf of Balkhan, a port on a sandy shore and the cost is estimated at 140 million roubles (£ 15,000,000).

The revenue for the cultivation of one half of the lands, without counting any benefits from the navigation, would amount to $500,000 \times 60 = 30,000,000$ roubles or (£ 3,200,000) equivalent to a return of 21.5 %.

The following would be the advantages of the scheme :

1. The navigable canal would serve as the principal means of irrigation ;
2. The flow of the current could be used gratuitously ;
3. The works could be executed by the use of dredgers, using the existing way for the purposes of gradually advancing ;
4. The results would be excellent from a financial point of view, permitting the substitution of a material (corn) by another (cotton) of 10 times its value.

Conclusions. — 1. The scheme, considered realisable two centuries ago by the Emperor Peter the Great, has not lost its importance.

2. The execution of this project is, according to all reports, desirable and should be recognised as urgent, being of great public interest.

The Session was adjourned at 3.30 p. m.

SECOND SECTION

(Ocean Navigation)

FOURTH SESSION

Friday 5th. June, 1908 (Afternoon)

The President, M. DE ROUMMEL

The Session was opened at 3.30 p. m.

THE PRESIDENT. — If you are willing, we will pass on at once to the examination of the fourth question, viz : —

General Conditions for the Security of Maritime Navigation

and follow on to the fifth question, viz : —

Hydrographical Exploration of the seas.

The General Reporter de Scholasky wishes to address the Meeting.

THE GENERAL REPORTER. — Before passing on to the agenda, I wish to call your attention to a completely new fact in the practice of our Congresses. It is the introduction of the two new questions for this section of océan navigation which our President has kindly read to us.

It is altogether unnecessary to insist on the great importance of these two questions now before an assembly of men of such high competency.

These questions are intimately connected with the object we have in view in this section for ocean navigation. It is natural that our Navigation Congresses occupy themselves in their prosperous march and in their progressive character in searching for

rules as regards the ocean navigation, this surface of water which covers about 70 % of our planet and which offers an outlet for immense quantities of merchandise. It is therefore indispensable that the whole maritime world should be carried on under such conditions that satisfy security.

All the world know what amount of profit-bearing and useful work it owes to the International Congresses; numbers of problems have been solved, thanks to the possibility of the discussion by specialists of the highest competency and belonging to the different nationalities, of all questions of interest to navigation. Those which figure to-day on our agenda will certainly gain a value when illuminated by the men of science and of talent present here, and by those who will discuss them at future Congresses.

The two questions which we are going to discuss to-day, are bound up in the same object, that of safeguarding commercial interests and human life on the ocean to the highest possible degree. I am sure you will receive them favourably and you will congratulate the initiative of the Board of the Association, in having placed there two new questions on the agenda of the XIth. International Congress of Navigation. (*Applause.*)

The fourth question referring to the security of maritime navigation has been the subject of five separate reports.

1. Report of Mr. de Schokalsky in which the question, after a general treatment of the subject, is studied from three point of view, buoying and lighting of coasts, nautical instructions, and cartography;

2. The Report of Mr. Rota in which the subject is attacked from a wholly different standpoint: the study of the security of navigation is made from the point of view of the ship itself, and the rational distribution of water-tight compartments;

3. The Report of Mr. Spitzin, Officer of the Imperial Navy, is a critical treatise on the system of lights which relates to international understanding on these points;

4. The Report of Mr. Timonoff treats on the salvage apparatus which might be carried on ships, to be used in cases of foundering on sandbanks or rocks;

5. And finally, the report of Mr. Anfimoff in which the author presents a new apparatus to signal by night and which is combined with a typewriter printing the received signals. This apparatus is exhibited at the entrance of the long corridor alongside the large hall.

You see from this short enumeration that the subjects are altogether different, in fact, it might be said quite dis-similar, and this is because the main question, as it is worded, is extremely vague and excessively wide. It can only be discussed in a very varied manner by the specialists of different professions. Under these circumstances, it seems to me that an International Commission should be appointed to study nearly all the points raised by the various authors, and also those questions which can arise out of the main problem.

Mr. ROTA. — I should like to say a few words on the subject of my report on the security of maritime navigation.

As regards the stability of ships, it is conceivable that it is very difficult to establish main rules which are applicable to all types of ships. On the other hand when a ship is on service, it may be of utility to indicate to the captain a safe means to verify the best distribution of load on board. This verification should, of course, be able to be made without calculations.

Mr. Archibald Denny, the well known shipbuilder, has suggested an instrument which would approximately solve this question. The description of this apparatus is given in the *Rivista Marittima*, 1896.

I express the wish that an instrument of this kind, or of a similar nature, should form an essential part of the equipment of a vessel. A new element of safety would thus be at hand on board.

THE PRESIDENT. — Does any one wish to speak on the subject of the security of maritime navigation? — No. — We have now to decide in favour or otherwise of the proposition made by the General Reporter.

It seems, however, necessary to standardise the methods of buoying and cartography in use in each country. The differences which exist are obstacles for navigation. I would therefore ask if it would not be well to word the conclusion as follows : —

« The Congresses expresses the wish that an International Commission should be instituted to standardise the methods of cartography and buoying, as well as the nautical rules. »

Mr. CHESTER (in English). — The question of the general conditions for the security of maritime navigation is so vast that it is not easy to arrive at a conclusion. For a great number of years,

the different nations have had different rules, but it is necessary to have a general basis for all nations, and for this reason I have prepared the following resolutions, in order to establish a uniform system for the requirements of navigation.

It is : — In view of the great importance which, for the well being and security of the sailors of the different nations represented at this Congress, would be offered by the establishment of a uniform system of rendering assistance for ocean navigation, which is the great road of intercommunication between the civilised countries, and which has been so well ventilated by the officials of the Government of H. I. M. the Emperor of Russia. The International Congress of Navigation assembled at St. Petersburg recommends to His Excellency, the President of the Permanent Board of the Congress, to ask the Government of H. M. King of the Belgians to invite each Government interested, to delegate one authority as a special member of a Committee which would hold its Meetings from time to time, according to necessity, in Paris, in order to study all matters concerning this question and to establish all the general regulations which might seem proper for the safeguarding of maritime navigation. »

« The Report of this Permanent Committee should be submitted for the approval of the various Government Departments in a form which the President of the Commission should deem right. »

Mr. le Baron QUINETTE DE ROCHEMONT. — The question of the procedure of lighting, buoying and the regulations for maritime navigation are different in each country. It would, therefore, be clearly of considerable advantage, if there were complete uniformity. It has been attempted to establish this uniformity within certain limits by the Conferences which were notably held at Washington, and where the different Governments were represented by Naval Officers and Engineers.

I believe the only procedure to arrive at the solution of the question is an agreement with the Governments, and according to my opinion, our Association of International Congresses of Navigation is not sufficiently qualified to achieve a very certain result. The question is complex. There are great difficulties in arriving at complete unison. The English, in particular, representing the largest factor in navigation, have great difficulty in changing the dispositions and forms which they have adopted up till now. As a result of the Congress at Washington, precision on certain points

has been arrived at, and I believe actually, there would be of very great advantage in the meeting of new conventions. I think, however, that such new conventions can only be promulgated through the intervention of a Government. It has just been proposed to have recourse to the Belgian Government. I have no objections to make. The Belgian Government could take the initiative, although it does not possess any large mercantile fleet, and convoke the other Governments, inviting them to meet, as was done at Washington represented by Naval Officers and Engineers. This is the only method of procedure.

But perhaps it would be more suitable to ask the Russian Government, who are perfectly qualified to undertake this initiative, for it is in Russia that the Congress is being held.

There would be of considerable advantage to act thus concerning the methods of buoying and lighting of the coast, the maritime regulations; the continuation of those questions which transpired at the Congress at Washington, and the new negotiations which might be opened up between the different maritime nations. The Congress might express a wish that the Russian Government should take the initiative.

THE GENERAL REPORTER. — In my position as General Reporter I can only heartily support the idea suggested by Mr. le Baron Quinette de Rochemont. Perhaps by this means we could attain our desired object.

THE PRESIDENT. — Would Mr. le Baron Quinette de Rochemont be so good as to formulate a motion in this sense? Before proceeding with the fifth question we will adjourn the Meeting for ten minutes.

* * *

The Meeting met again at 5 o'clock.

THE PRESIDENT. While waiting for the resolution of Mr. le Baron Quinette de Rochemont, we will begin, in order not to lose time, the fifth question which is on to-day's agenda, viz : —

Hydrographical Exploration of the Seas.

The General Reporter, Mr. Mordovine being absent, I would ask Mr. Lemer cier to read his report.

Mr. LEMERCIER read the report which terminated with the following conclusions and an expressed desire :

1. The employment of photography in the topographical surveys;
2. The latitude and longitude of the shore zone to be marked on the sea charts;
3. The method of representation of the soundings on the charts;
4. The standard zero-level for depths;
5. The method admissible for the study of the periodic and non-periodic currents;
6. The organisation of magnetic observations of the shore and their co-ordination for the purposes of the sea charts;
7. The elaboration of rules for the conduct of hydrological explorations, and for the formation of all possible collections;
8. The programme for the determination of the results relating to the description of the channels and a general scheme for establishing the description of these;
9. The fixing of a uniform system for the reproduction of multiple local designations;
10. Finally, a uniformity in the outward form of the charts so as to admit of systematic marking.

I think that an international agreement on the subject of all these questions, which should regulate them under the form of special instructions or of a programme of which the navigators and hydrographers could in a general way make use, would be of very great service, and that although it be somewhat complex, the regulation of this question would be subject worthy of discussion and resolution by a special international commission.

The General Reporter formulates the wish that at the next Congress representatives of the different nations should report on the history of the development and the state of the hydrographic science of their country.

THE PRESIDENT invites the authors to speak.
No one wishes to.

THE PRESIDENT. — Gentlemen, the wish expressed by the General Reporter is the same as that desired for the fourth question. It only seems to me that the fourth and fifth questions could be incorporated in one resolution, in other words, to add to the observations of Mr. le Baron Quinette de Rochemont, referring to buoying,

lighting and maritime rules, the wishes as regards the subject of hydrography. This appears to me useful.

The General Reporter, as you have just heard, has expressed the desire, that at the next Congress, reports on Works which have been done in maritime hydrography in the various countries, should be presented. That is also very interesting and we express the wish that it may be fulfilled at the next Congress.

Here is, Gentlemen, the note prepared by Mr. le Baron Quinette de Rochemont on the discussion of the fourth question.

Mr. Lahaussais read the note. It is formulated as follows :

« The second section of the Congress, in consideration of the great interest in the introduction of unison in the rules relating to lighting and buoying of coasts as well as the maritime regulations, express the wish that the question be submitted, through the initiative of a Government, which might with utility be that of Russia, to an International Commission composed of Seamen and Engineers. »

THE PRESIDENT. — This wish, thus edited, meets with the general assent of the Meeting and is passed.

I think it would be useful to add a paragraph which would have the effect of uniting the fourth and fifth questions in other words, to add a word referring to Hydrography and Cartography.

We might, furthermore, express the wish that the same question be presented to the next Congress (*Hear, Hear*).

While waiting for the wording of the motion to be submitted for your approval, Mr. Vladimiroff wishes to make a short communication on the formation of ice at the bottom of rivers.

This very interesting question was treated by Mr. Vladimiroff who already had the goodness to lay the matter before the first section, where it is reported on page 254.

THE PRESIDENT. — The second section is in sympathy with the ideas expressed by Mr. le Baron Quinette de Rochemont referring to the fourth question; we might complete it in the following manner, taking into consideration the desire expressed with regard to the fifth question.

« The second section of the Congress resolves :

» Whereas it would be of the greatest advantage to introduce
» uniformity in the wording of nautical directions, into the conven-

- » tional signs made use of in nautical charts, and finally into the
- » rules relating to navigation, to lighting and to buoying the coasts
- » 1. That the question be submitted (on the initiative of a Govern-
- » ment, which could be well that of Russia) to an International
- » Conference composed of seamen and civil engineers ;
- » 2. That this question be dealt with again at the next Congress. »

The section accepts this resolution.

A MEMBER. -- I wish to point out that in this resolution the paragraph relating to the discussion of questions on the hydrographic exploration of Seas at the next Congress is not included.

THE PRESIDENT. — It will be taken into consideration. The Meeting rose at 5.30 p. m.

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SECOND SECTION

(Ocean Navigation)

FIFTH SESSION

Saturday, 6th June 1908 (Morning)

President MR. DE ROUMMEL.

The Session commenced at 11 a. m.

THE PRESIDENT. -- We have now to turn to the first communication entitled :

Appliances for Repairs (Dry Docks, Floating Docks, Lifting Apparatus, etc.)

Mr. Tréniukinn, the General Reporter, will address the Meeting.

THE GENERAL REPORTER gave a summarised sketch of his report, and concluded as follows, after touching on the advantages and the disadvantages of the different types of appliances for repairs which are at present at disposal.

1. In consequence of the ever-increasing dimensions of ships, especially in width and draught, it seems desirable that the appliances designed for the inspection and repair of the largest ships should be able to hold ships of 300 metres (1,000 feet) in length, 30 metres (100 feet) in width and 10 to 11 metres (33 to 36 feet) draught. Hereby, in this branch of harbour construction, that forcible impediment to progress in shipbuilding as regards the the practical realisation of the best type of ship for the quick, economical and most advantageous transport of goods, would, to the general advantage of navigation, be removed :

For the inspection and repair of the largest ships at the present time only dry and floating docks can be employed. Neither of these types pre-eminently presents unqualified advantages, whether

they be technical, economical or exploitative. The technical progress made during the last few years in the construction of floating docks puts these practically on a level with dry docks as regards their possibilities and their security for docking the largest merchant vessels and the heaviest warships.

2. The choice of a type of dock (dry dock or floating dock of this or that system) must, in every separate case, be based on a thorough study of the natural local conditions, and of the character of the work for which the dock is designed, by weighing the advantages and disadvantages presented by the different types, having regard to the local conditions in question.

3. Independent of the permanent appliances for the inspection and repairs of ships, a further improvement seems desirable in the existing methods of getting convenient access to the parts of a damaged ship that are under water, whether on the principle of the dry dock or of under water floating dock (detachable caisson) by an elaboration of a simple, cheap and rapidly built construction for such temporary appliances. One of the solutions of this problem under favourable conditions may be a temporary dry dock consisting of a stone cofferdam with a covering of earth and a sand bed for the keel.

THE PRESIDENT. — Does any one wish to speak? Mr. Flamm.

MR. FLAMM (in German). — The Report of Mr. Asmussen is one sided. He speaks of the advantages of floating docks but he only gives details of constructions patented by a group of interested parties. The economy of working the docks of Messrs Asmussen, Dieckhoff and Klitzing, is to all appearances very advantageous, but the economy is not real, because, if the expense of the docks is small, it is nothing, when compared with Royalties to be paid for the Patents. Further, the « Dieckhoff Dock » has a very bad reputation as regards stability; the « Asmussen dock » was the subject of an English patent of Mr. Rennie as early as 1863; the « Klitzing dock » demands hermetical rivetting and the immersion requires much time on account of compressed air. In consequence of these inherent disadvantages in the patents of the floating docks of the interested patentees, treated in Mr. Asmussen's report; the latter does not bring forward as generally accepted the advantages of floating docks, it requires to be re-drafted.

M. VANDERLINDEN. — We have listened to the honourable General Reporter, who has with great precision summarised the various reports presented to the Congress. In his conclusions he has placed almost in the same category the dry and floating dock. Well, I cannot associate myself with these conclusions, and in order to justify my point of view, I think I must rapidly review the advantages and disadvantages of both systems.

As regards floating docks, it is clear that the pumping is proportional to the tonnage of the ship. According to this report, this factor is accepted for dry docks, where the pumping required is inversely proportional to the tonnage. But looking at the question from a general point of view, does this consideration affect a saving in time and coal? It appears unimportant. It is also true that floating docks have a better prospect in the future in the sense that they can be lengthened easily. The same operation can nevertheless be undertaken with respect to dry docks, although, I admit, the operation may be possibly fraught with difficulties. There are a number of cases, where it has been done.

Another advantage which might be considered of value as regards floating docks, is that they require less time for construction.

Finally, as regards first cost, I am led to believe, that for docks, and floating docks of large dimensions, the floating docks will probably usually require less capital expenditure above all, where it is a matter of attaining great depth and the ground requires suitable foundations.

But in face of all these advantages, floating docks present serious inconveniences; firstly the heavy maintenance of such structures; in consequence their life is short; dry docks, for instance — entailing a less costly maintenance — have a practically unlimited life, and this is a great advantage. The floating type further requires very large and deep basins. It demands much space, and is difficult of access, because it is placed in a large area of water. Finally, the pontoon of a floating dock gets deformed at last in use, under the influence of the forces acting on it and a similar deformation may re-act on the shape of the vessel. This is also a very serious inconvenience.

There is still another disadvantage, and on which I consider the most important of all, that must be mentioned. It refers to the manipulations required for a floating dock which are always deli-

câte, and remember that one mistake of the staff in working the dock may call forth a disaster.

Nothing similar can clearly be said of a dry dock. This form besides has a quasi-unlimited life, is less costly in maintenance and absolutely safe in point of working.

I will therefore conclude in this sense, that even in spite of the first cost being higher --- within certain limitations --- dry docks deserve the preference and, on the whole, recourse should only be made to floating docks where other means do not exist.

Such is the case, where the adjacent ground is so bad that the construction of a dry dock, is almost impossible on account of the heavy expenditure. Such is also the case where it concerns the establishment of docking facilities in countries far away from industrial centres, in colonies, for example. There the required staff will not be found to build on site such works as dry docks. The floating dock can, on the contrary, be constructed in the home country, and a few intelligent workmen are only necessary for its final erection in the country where it is to be used.

MR. MENDES GUERRIERO. — Mr. Vanderlinden has touched on a point which, according to my opinion, is of the greatest importance. It is the question of the establishment of repair docks in the colonies. The construction of a dry dock in a colony demands a very considerable expenditure; therefore, commencement is made by the erection of a floating dock, and it is only when the harbour has become very important that the dry type is decided on.

Allow me to give you a few examples.

Take the Portuguese Colony in West Africa (the speaker demonstrates on maps and plans) the Port of Loanda possesses a floating dock. There is a floating dock established at Lobito which, 5 years ago, only had a simple quay, and to day claims the means of repairing ships. This port is in communication with the Ports of Beira and Lorenzo Marquez which have become very important for Europe by the fact, that the post can go from one side of the Continent to the other in order to serve Madagascar, saving about 4,400 miles (7,000 kilometres).

In Hindoustan, the Port of Goa serves a line of 1,900 miles (3,000 kilometres), and a floating dock is also established there.

In China too, the Port of Macao will be joined by rail to Canton, and a floating dock will likewise be established.

I think that floating docks are more useful for Colonies.

MR. BORMANN (in German) proposes to substitute Articles 2 and 3 by the following :—

ART. 2. — Dry docks and floating docks may be considered as equally safe in their working.

ART. 3. — The choice of type of dock depends on the natural conditions and the requirements for the exploitation.

M. FRANZIUS (in German). — Gentlemen, on the question of floating docks, I am to-day of the same opinion as in 1902 when at the Congress of Navigation I, as General Reporter, proposed the resolution which was then adopted. I must, however, acknowledge that, since that time, floating docks have been improved in various ways, so that I can understand that in a given case, the use of floating docks is recommended to-day, where I myself would consider that dry docks would answer the same object. But it seems to me quite impossible to accept that, parallel with the two means eminently suitable for dry docking large vessels, the construction of an earth or stonework dam should be recommended, a means that might be employed in default of others in the case of a ship which has foundered or been wrecked, a method which can never be compared with that of docks.

For this reason I would propose that the final paragraph of the resolutions of the General Reporter should be suppressed. Perhaps it might be stated *Under exceptional circumstances* recourse might be necessary to a method requiring the employment of a dam.

MR. DE JOLY. — I think, gentlemen, that, at this hour, it is difficult for us to adopt a text *in extremis* as long and as wide as that proposed by the General Reporter.

I propose, at this advanced hour, that on account of the complexity of the resolutions proposed, and with regard to the rules governing the Congress, which define a distinction between communications and reports, of limiting the agenda of the day to recording the written and verbal observations which the Congress has listened to.

THE GENERAL REPORTER. — Gentlemen, I would like to reply to Mr. Flamm, that I had only in view in my report the general progress of floating docks in practice, without binding myself to either the one or the other system.

As regards the views of Mr. Vanderlinden, my report includes a comparison of the disadvantages of floating and dry docks.

There is one point to which I would, however, attract your attention. It is, that it is easier to follow the progress of naval shipbuilding with floating docks. The more so, as floating docks can be constructed in the same time as the ships, and as this is not the case with dry docks.

As regards docking a vessel, the dry docks are clearly the safer. — Then in reply to Mr. Franzius, I would repeat, that the conditions, in which a ship may have to be docked in a temporary dry dock depend entirely on the local circumstances.

Lastly, I would say, that the comparison of the advantages of floating and dry docks give results of equal value in the two systems, and I therefore associate myself with the proposal of Mr. Joly.

THE PRESIDENT. — The result of the preceding discussion is, that the question of dry or floating docks should remain still undecided, as at the Congress at Düsseldorf. Some authorities find that dry docks are the more practical. Others consider that preference should be given to floating docks. It does not seem to me possible under these circumstances to pass a resolution. We should not be justified, in face of the opposite opinions expressed on this subject; and I entirely agree with Mr. Joly that this matter should be considered as a communication and a record of the written and verbal observations, both as regards the remarks of the General Reporter, and of the other speakers present here should be made in the agenda of the day. I would, however, further propose, Gentlemen, that this subject should be incorporated in the programme for the next Congress as a question.

The section approved of this method of action.

THE PRESIDENT. — The Board will submit to you in a few minutes the resolution to be adopted. We will then pass on to the second communication.

The meeting re-commenced after an interval of 5 minutes.

The decision referring to appliances for repairs was read. The wording had been edited in the following terms :

« By reason of the complication of resolutions proposed and of » the rules adopted by the Congresses, which make a distinction

» between communications and questions, it has been decided to
» express no definite conclusion, but to take into consideration the
» oral and written observations made during the sitting of the
» Congress; and the desire has been expressed that the communi-
» cation (Repair Apparatus) appear as a question on the pro-
» gramme of the next Congress. »

The section passed the resolution unanimously.

THE PRESIDENT. — We will now proceed with the second communication, namely : —

*The best types of sea going vessels for the transportation of goods
as connected with inland navigation routes and harbours.*

Mr. Boklevsky, General Reporter is absent.

His report is read, it terminates with the following conclusions : —

1. The question of the best type of merchant ship cannot be solved in a general way in all its bearings, it must be solved for each particular case, as it depends on the kind of service required of the vessel ;

2. In view of realising the greatest possible economy, it is advisable to increase the tonnage as far as the limits allowed by the conditions of navigation will permit ;

3. Merchant ships for the transport of goods of low value need not have great speed ;

4. In all cases where the goods need not be delivered promptly and where it is possible to make use of the wind as a propelling power, sailing vessels should be resorted to as being the most economical ;

5. Sailing vessels should be fitted with auxiliary internal combustion engines ;

6. The steam machinery for merchant ships should be replaced by internal combustion engines, with a view of reducing the cost of working these vessels and of increasing their load and bunker capacity.

THE PRESIDENT. — The Report of Mr. Boklevsky is a very interesting communication which I would ask you simply to incorporate in the Minutes of the Congress, as there is no time to examine the conclusions of the author.

The second section agrees to this proposal and passes the following resolution.

« After hearing the Report of Professor Boklevsky on the best » types of vessels intended for transportation of freight, the second » section has decided (1) to take note of this interesting communication and to forward to the author its sincere thanks. »

The meeting rose at 1.30 P. M.

THIRD COMMUNICATION.

The third Communication : —

*Application of Reinforced Concrete to Maritime Works.
Methods of ensuring its preservation.*

was examined in a combined meeting of the two sections (see page 260 of the Minutes of the Proceedings of the Congress).

FOURTH COMMUNICATION.

The communication on the most recent works carried out in the principal seaports, for which Mr. Jankovski was appointed General Reporter, and which figured on the programme referring to ocean navigation, was not examined by the second section.

(1) According to Article 14 of the rules of the Permanent International Association of Navigation Congresses. « The communications have no place either in the votes or in the examination of a plenary meeting ».

PROCEEDINGS
OF THE
SECOND GENERAL MEETING
(Concluding Meeting)

Sunday June 7, 1908 (Morning)

The meeting opens at 10 o'clock in the large hall of the Conservatoire, under the presidency of Mr. de Timonoff.

The assembly is a particularly brilliant one ; the diplomatic tribune is full and many ladies occupy the boxes which have been reserved for them.

The following are seated at the table : the Assistant of the Mayor of St. Petersburg ; His Excellency the Minister of Greece ; Mr. Richald, Assistant Secretary of the Executive Committee of the Permanent International Association of Navigation Congresses ; Freiherr von Coels von der Brügghen, Under-Secretary of State ; Mr. Troost, Directeur Général des Ponts et Chaussées ; Baron Quinette de Rochemont, Inspecteur Général des Ponts et Chaussées ; Mr. L. Faragó, Sectionsrat, Stellvertreter der K. Ung. Landes-Wasserbaudirektion ; Colonel Ockerson, U. S. Commissioner of the Mississippi River Improvement ; Commander Italo Manganzini, Sectional President of the Superior Council of Public Works.

The following have taken their seats on the platform : the foreign members of the Board of the Congress, the members of the Boards of the Sectional Committees and the delegates of the foreign Governments.

THE PRESIDENT : —

Ladies, Gentlemen,

I will call upon Mr. Deking-Dura who is delegated by the Executive Committee of the Association to read the conclusions which have been formulated by the Sections on the questions on the agenda of the Congress.

We will commence with the **First Section** which deals with **Inland Navigation**.

Mr. DEKING-DURA : —

FIRST QUESTION. — *How to arrange dams in rivers, in which the discharge varies greatly and which even carry large amounts of ice, so as to protect the interests of navigation and industry.*

CONCLUSIONS

1° These points should be observed in the construction of dams : —

a) The level of the surface of the pool should be regulated as accurately as possible ;

b) Quickness of working should be assured and its safety be increased by placing the operating machinery on the permanent works ;

2° It is important that the whole width of the dam should be opened as quickly as possible, especially on rivers subject to sudden rises or carrying large amounts of ice. It is well to be able to withdraw from the water all the movable parts of the work. Dams with movable gates and supports, and also drum dams have been fully tested. The latter have the advantage of allowing a certain quantity of ice to pass without reducing perceptibly the level up stream ;

3° The system of movable dam which, if needs be, furnishes the means of maintaining, during the passage of floods and ice, the head of water required for driving the factories which use it, depends upon the regimen of the stream. There are to be found already at many places, dams of the kind which, in a single piece, cover an opening 30 metres in width ;

4° Fixed dams are advisable for wide rivers liable to heavy accumulations of ice when the level of the upper pool need not be exactly preserved ;

5° The defect of fixed dams, which do not allow the level of the pool to be regulated, may be remedied in certain cases by making the upper part movable or by building a movable dam alongside of the fixed dam ;

6° The study of a dam should be accompanied by observations on the way in which the ice forms and on the way in which the cakes of ice are carried by the river; it requires also a knowledge of the conditions under which the work has to stand the impact of the ice.

THE PRESIDENT. — You have heard, Gentlemen, the conclusions of the first question of the first Section. Are there any objections?

The conclusions are adopted.

Mr. DEKING-DURA : —

SECOND QUESTION. — *Study of the economics, technics and regulations for operating and for hauling boats mechanically on rivers, canals and lakes. — Monopoly of traction.*

CONCLUSIONS

1° Traction on canals : —

a) No general solution can be given for the question of knowing whether monopoly of traction should be obligatory on canals : it is proved however that increase of traffic leads necessarily to the organization of a technical service which ensures to the canal its highest efficiency. This result is obtained first by a uniformly regulated traction service to be established by the owner of the canal or his representative ;

b) The economic and financial conditions of canals being liable to quite frequent changes, the influence of the uniformly regulated service upon the said conditions ought to be studied in each special case. But the traction monopoly, if it be granted, ought not in any case to give the right of establishing a tariff higher than what is necessary to defray the expenses of operating and to guarantee the sinking fund and interest of the capital invested ;

2° Traction upon canalized rivers : —

On account of the diversity of local conditions, it is impossible to formulate, for canalized rivers, any general opinion on the organization of traction. But, in this case also, the increase of traffic will force the adoption of a uniformly administered traction service so as to attain the maximum efficiency of the navigable highway ;

3° Traction on rivers with an uninterrupted current : —

In general, on non-canalised rivers, traction may remain free. But a traction service suited to the local conditions of the navigable highway can improve the traffic ;

4° Considering the important progress realised of late on canals by uniformly regulated electric traction, the Congress resolves that electric traction on canals be presented as a question in the order of business of the next Congress.

THE PRESIDENT. — Are there any objections ?
The conclusions are adopted.

Mr. DEKING-DURA : —

THIRD QUESTION. — *Equipment of inland navigation ports.
Especially the progress of electric installation.*

CONCLUSIONS

An inland navigation port should satisfy the following conditions : —

1° To be established in a manner to serve best the interests of works and manufactories of the locality in question ;

2° To provide : —

a) Convenient and accessible transfer stations between the waterway and railway ;

b) Places for provisionally storing goods about to be re-forwarded ;

c) Special docks suitable for goods of different kinds ;

d) Quays and other landings suited to the nature and importance of the traffic and extending as far as possible towards the centre of the districts to be served.

THE PRESIDENT. — Are there any objections ?
The conclusions are adopted.

Mr. DEKING-DURA : —

FOURTH QUESTION. — *Mixed canals which can serve at the same time the interests of navigation and agriculture.*

CONCLUSIONS

1. The establishment of a mixed canal, at once meeting the requirements of navigation and of agriculture, raises numerous local questions and therefore requires special consideration in each particular case ;

2. In low lands, well cultivated and with a dense population, irrigation and drainage canals can be utilised in some cases for the transport of agricultural produce, of manure and heavy goods of bulky size and little intrinsic value ;

3. The consideration of questions regarding mixed canals is not sufficiently investigated and ought to be retained on the programme of the next Congress.

THE PRESIDENT. — Does anyone wish to make any remarks ?
The conclusions are adopted.

Mr. DEKING-DURA : —

FIFTH QUESTION. — *Preservation of low-lying districts from the encroachment of water.*

CONCLUSIONS

1. The use of embankments which cannot be submerged with the object of preserving low districts from the encroachment of the water of large rivers has succeeded in numerous cases ;

2. Insubmersible embankments built of earth can effect their object when the technical service is well organised and when maintenance works are well executed ;

3. The maximum of economic efficiency is reached by the erection of protective works and by the simultaneous execution of agricultural improvement works in the protected districts : sometimes it is necessary to have an artificial outlet for the water ;

4. Every step to be taken against the encroachment of the water should consider the changes which such steps might possibly bring

about in the regimen of the river both above and below. It is therefore, advisable to execute only such works as will form a complete whole, well proportioned in all its details and applicable to the entire basin of the river.

THE PRESIDENT. — Are there any objections?
The conclusions are adopted.

Ladies and Gentlemen,

Before dealing with the questions which come under the Second Section, allow me to read out to you the following telegram which has been sent to our colleague Mr. Marshall Stevens by the *Board of Trade* of London : —

« *Great Britain joins Permanent Association Congresses for inland navigation only.* *Board of Trade.* »

This means that England, which had not yet become a member of the large family of Navigation Congresses, now belongs to the Association but confines its adhesion exclusively to inland navigation.

I congratulate our International Body most warmly on this important conquest. (*Great applause.*)

I will ask Mr. Deking-Dura to be good enough to read out the conclusions regarding the questions of the **Second Section** which deals with **Maritime Navigation**.

MR. DEKING-DURA : —

FIRST QUESTION. — *Fishing ports, and harbours of refuge for the coasting trade.*

CONCLUSIONS

1. The development of the fishing industry and the improvement of Coast Navigation conditions are of great general interest.

They demand the establishment of harbours of refuge, fishing ports of local importance, and large ports for sea fishing :

2. Harbours of refuge for the coast trade should be rather inexpensive, be found close to ship routes and provide safe anchorage. The approach to these ports should be convenient and safe for sailing vessels, in all weathers, day and night. Such ports require no special equipment :

3. Sea fishing ports should give facilities for unloading the fresh fish as quickly as possible, for its sale by auction, its packing, salting and forwarding inland by rail : with this object, the quays should be sufficiently wide to establish the necessary installations and to lay railways on them : special quays will be reserved for the supplying the steamboats with coal, provisions and fishing tackle.

The area of the water surface should be sufficient to give anchorage not only to fishing boats but also to ships which are driven to seek shelter in bad weather. It is obvious that the selection of the position of shelter and fishing ports will depend on the local conditions of navigation for each country or district and particularly on the fixedness and possible increase in the fishing population. For these different reasons detailed studies of the sea coasts are indispensable.

THE PRESIDENT. — Are there any objections ?

The conclusions are adopted.

Mr. DEKING-DURA : —

SECOND QUESTION. — *Inland sea ports and their means of access.*

CONCLUSIONS

1. Inland maritime ports are generally more suited to the service of great navigation lines when the latter have their home port there; they are seldom suitable as points of call ;

2. To preserve and develop the commercial and economic character of inland ports, it is desirable to guarantee to their approaches and their works such depths as shall be largely sufficient for the future, while keeping financial possibilities in view.

When the inland port is situated on a river, the depths ought, if possible, to reach the maximum consistent with the hydraulic power of the latter. The approaches to inland ports should, in

principle, be free of obstacles such as bridges or locks, of which the number should be reduced to a minimum ;

3. At the time of the establishment of an inland sea port, it is better to place it as far as possible in the interior so as to bring it near the industrial and agricultural centres while keeping in view the economic and social conditions of the country passed through.

If the harbour must remain far from the heart of this country, it is well to make it the terminus of a system of completed inland navigation lines.

THE PRESIDENT. — Does anyone wish to make any remarks ?
The conclusions are adopted.

Mr. DEKING-DURA : —

THIRD QUESTION. — *Construction of harbours on a sandy shore.*

CONCLUSIONS

1. The entrance to a harbour situated on a lagoon opening into a sea can be effected by means of parallel jetties built on the principal channel leading to the lagoon. The action of the tide is sometimes sufficient to insure the necessary depth of water upon the bar which generally tends to form at the end of the jetties; but often the dredging-machine must be used in addition. The strength of the tidal currents in the pass leading to the port should be increased by enlarging the capacity of the reservoir formed by the lagoon and by closing the secondary arms of this lagoon ;

2. Except in the case alluded to in the preceding paragraph, the maintenance of the depths can only be secured by means of dredging ;

3. As parallel jetties give no roadsteads and offer no special advantage from the point of view of maintaining depths, their use is only recommended in the case mentioned in the first paragraph above ;

4. Jetties, whether parallel or converging, must, to be of service, be prolonged to depths where the erosive action of the sea is no longer felt ;

5. Converging jetties must be strongly inclined towards the shore so as to offer no obstacle to the passage of alluvial deposits carried onward by the littoral currents ;

6. In case that the movement of materials along shore be very great, it is of advantage to have recourse to moles or breakwaters parallel to the coast, or even to place the port out in deep water and to connect it to the ground by means of open piers. In this case the moles or other works of entrance to the port should be as far from the shore as local circumstances permit.

THE PRESIDENT. — Are there any objections ?

The conclusions are adopted.

Mr. DEKING-DURA : —

FOURTH QUESTION. — *General conditions of security
for ocean navigation.*

FIFTH QUESTION. — *The hydrographic survey
of the seas.*

The second section of the Congress : —

Whereas it would be of the greatest advantage to introduce uniformity into the wording of nautical directions, into the conventional signs made use of in nautical charts, and, finally, into the rules relating to navigation, to lighting, and to buoying the coasts.

The second section of the Congress resolves : —

1. That the question be submitted (on the initiative of a Government which could well be that of Russia) to an International Conference composed of seamen and civil engineers ;

2. That this question be dealt with again at the next Congress.

THE PRESIDENT. — Does anyone wish to make any remarks ?

The conclusions are therefore adopted.

May I propose a vote of thanks to Mr. Deking-Dura who has undertaken the important task of submitting to you the conclusions of these ten different questions. (*Applause.*)

Ladies, Gentlemen,

His Excellency the Minister of Ways of Communication is unwell and unable to be present at our closing meeting. I am requested to read you the speech which His Excellency had intended to make had he been here. (The speech is read in Russian.)

I will endeavour to translate the speech of the Minister of Ways of Communication.

Ladies, Gentlemen,

I have followed the work of the XIth. International Navigation Congress with profound interest. I have much satisfaction in seeing the brilliant results which have been acquired by the discussion of the reports and by their resolution into a series of important conclusions on many questions relating to navigation.

The reports submitted to the Congress have thrown light upon technical points which are of interest to all countries and particularly to Russia, which is on the eve of carrying out great improvement works in its inland navigation.

The first question dealt with by the Congress — that of dams across rivers with a large outflow which eventually carries away the ice-flows — is specially important to us and the detailed conclusions of the Congress will be exceedingly useful when drawing up the plans.

The question of mechanical traction on rivers and canals from an economic and a technical aspect, raised quite a discussion as one might have expected. Many eminent speakers took part in the discussion and demonstrated the progress which has recently been realised in electric traction.

As regards the question of the ports of inland navigation, the Congress has confirmed the correctness of the principles which govern the creation of these ports, especially the necessity of devoting special docks for special merchandise and constructing separate ones for goods which are easily inflammable.

The importance of canals which are used for both navigation and agricultural purposes has been demonstrated and the con-

clusions adopted by the Congress on this point will have great weight in the numerous irrigation schemes which have been mooted and amongst others for those which will in all probability be carried out in Russian Turkestan.

The Congress has not ignored the protection of low-lying lands against floods, that great problem which the engineer has always to face when improving waterways and the solution of which is so bound up in the interests of the cultivation of the land adjoining rivers, especially in densely populated districts.

The use of reinforced concrete has rightly taken up the attention of the Congress, as this new material of construction is becoming of increasing use for foundations on bad soils or for those portions of structures which are subjected to water pressure.

We must also take note of a question which has occupied quite a portion of the time of the Congress, namely that which concerns the resources available for the development of inland navigation, including, where necessary, the rights which the Government possesses of purchasing part of the land along the new waterways.

Lastly, as might be expected, the Congress has dealt with the service of hydrometry which announces approaching floods and indicates the navigable depths available.

Even this brief list of conclusions relating to inland navigation shows sufficiently the useful purpose of the work of the St. Petersburg Congress, and I consider it my duty to express my gratitude to the Permanent International Commission and especially to its General Secretary, M. Dufourny, as also to the General Presidency and the General Secretary of the Congress, to the Presidents, Vice-Presidents and Secretaries of the Sections of the Congress.

Allow me also to express the grateful feelings with which we shall always remember the gracious visit to Russia of so many eminent engineers and other workers in the peaceful and civilising arts of navigation.

Ladies, Gentlemen,

Allow me to remind you of the important part which His Excellency the Minister of Ways of Communication has taken in the XIth. Navigation Congress. The necessary funds were

granted thanks to his aimiable intervention, and I feel sure you will gladly show him your gratitude for this. (*Applause.*)

THE PRESIDENT. — I will call upon Freiherr von Coels von der Brügghen, delegate of the German Government, to speak.

FREIHERR VON COELS VON DER BRÜGGHEN : —

Esteemed Ladies and Gentlemen,

The XIth. Navigation Congress has been a great success. It has brought forth numerous and excellent reports, and been prolific with discussion. We may well hope that this will have useful with practical results and will act as an impetus for future scientific enquiries.

We owe this fortunate result of the Congress chiefly to the interest taken in it by His Majesty the Emperor who not only accepted to act as Patron of the Congress but also received the delegates in a manner which will never be forgotten by those who were present at the reception.

We are also indebted for this success to the active part taken in the Congress by His Imperial Highness the Grand Duke Michael Alexandrovitch and by their Excellencies the Ministers, whom we have had the honour of seeing so frequently among us.

Our indebtedness is also due to the Local Organising Commission and especially to its chief, Mr. de Timonoff, who has accomplished his task so thoroughly. We have been so excellently led both in debates and outside of these, that we did not realise that we under so sure a guide. All who recognised Mr. de Timonoff as a capable and aimiable colleague, will know him henceforth as an incomparable organiser.

We expected great things of our journey here, and our expectations have been more than surpassed. What we have seen and experienced here : St. Petersburg and its vastness, its serious work, its collections and monuments which show great artistic feeling, its aimiable hospitality, will remain indelibly graven in our memories hereafter. (*Applause.*)

THE PRESIDENT. — I will call upon Mr. Kautzky, delegate of the Austrian Government, to say a few words :

Mr. KAUTZKY : —

Ladies, Gentlemen,

There is not much that I can add to the very eloquent and enthusiastic remarks of the last speaker.

Austria appreciates most particularly the economic and political importance of navigation owing to its hydrographical configuration. Each of our large rivers runs into another sea. For a long time past there had been a desire to connect these rivers with one another, and our legislature has sanctioned the project after examining it very thoroughly. When carried out this scheme will not only give a further impetus to national economics and to the development of international relations, but will unite in fresh bonds all the peoples of the Empire.

All that furthers this idea finds a welcome in our Austrian hearts.

For this reason I address to the Permanent Commission of Navigation Congresses which has supported this idea, the special thanks of Austria and ask you to join with me in saying :

Long live the Permanent Commission ! (*Great applause.*)

THE PRESIDENT. — I ask call upon Mr. Troost, delegate of Belgium, to speak.

Mr. TROOST : —

Ladies, Gentlemen,

The Congress decided at its closing meeting, that the Government delegates would have the right and honour of addressing thanks to Russia, to H. M. the Emperor, to H. I. H. the Grand Duke Michael Alexandrovitch, Honorary President of the Congress, to their Excellencies the Government Ministers and to the Organising Commission of the Congress.

Time being short and precious, I will carry out the duty which has fallen upon me as first delegate of Belgium, with great con-

ciseness and will keep my remarks within narrow limits in keeping with those of my country.

Never have we passed our time so rapidly or employed it so well and never have we found a more complete or better organised programme. We have not lost a single minute.

Exhibitions, congress meetings, excursions and receptions have absorbed our time so quickly and so completely that it seems as if we had only been a few instants at St. Petersburg. Our mission is hardly commenced than we find it has ceased to exist.

Honour and thanks to all, to His August Majesty who occupies the throne of Russia, to H. I. M. the Grand Duke Michael Alexandrovitch, to the ministers who surround and support the throne, and to the Presidency of the XIth. Congress.

Honour and thanks to all who have welcomed us here, who have received us, instructed us and supplied us with information with such solicitude and goodwill.

Honour and thanks and long live Russia! Long live the Emperor! (*Great applause.*)

THE PRESIDENT. — I will now call upon Mr. Liou-Si-Tchang, delegate of the Chinese Empire, to speak.

Mr. LIOU-SI-TCHANG : —

Excellencies,

Ladies, Gentlemen,

In the name of the Chinese delegation it is my duty and pleasure to express our gratitude first of all to the Imperial Russian Government for the welcome we have received in Russia. We must next thank the city of St. Petersburg, which is represented here by the assistant Mayor, and thank our distinguished President, Mr. de Timonoff and the members of the Organising Commission of the XIth. Congress for their charming and cordial reception of us during our short but agreeable stay in St. Petersburg.

Allow me, Ladies and Gentlemen, to tell you how happy we are to be here and to find ourselves in the midst of learned and scientific men who have come from all parts of the world.

The maritime and fluvial questions which have been discussed in the sections of the Congress are of special interest for China and I can assure you that we shall lose no time in acquainting our Government with the conclusions which have been adopted.

In conclusion, Ladies and Gentlemen, I will ask you to join me in exclaiming : —

Long live H. M. the Emperor Nicholas II ! Long live H. I. H. the Grand Duke Michael Alexandrovitch ! Long live the city of St. Petersburg. (*Great applause.*)

THE PRESIDENT. — I now call upon M. de Uhagon, delegate of Spain, to speak.

Mr. DE UHAGON : —

Ladies, Gentlemen,

It is my pleasing duty before we separate to express, on behalf of the Spanish delegation over which I have the honour of presiding, our gratitude to the Russian Government and especially to the President and Organising Commission of the XIth. Navigation Congress, as well as to the engineers of Ways of Communication and the Marine, for the kind welcome we have all received.

It is my pleasing duty also to express our gratitude to H. M. the Emperor Nicholas II, and I wish all success and prosperity to Russia. (*Applause.*)

THE PRESIDENT. — I now call upon Mr. Ricardo Ramos, second delegate of Spain, to speak.

Mr. RICARDO RAMOS : —

Ladies and Gentlemen,

Allow me on this auspicious occasion, and on behalf of the official Chamber of Commerce, Industry and Navigation of Barcelona and on behalf of the Spanish Transatlantic Company, to express to the meeting our great admiration for the task which

has been accomplished at St. Petersburg and which carries on the work of peace, brotherhood and progress of International Navigation Congresses.

Representing as I do the active side of the economic life of Barcelona, it is a great honour to me to salute my illustrious colleagues in this meeting with all the affection and esteem which arise from the common bond of interests which guide our path and which are the outcome of civilisation and of the desire to attain the greatest comforts and the highest perfection. By continuing on these lines we shall follow the motto of the body which I have the honour to represent here « *Terra dabit merces, undaque divitas* ».

The numerous tokens of affection and cordiality which we have received, prove once more the truth of the reputation of the Russian people for hospitality. Our sojourn in Russia will remain indelibly graven in our memory and for this we thank you most gratefully.

The task accomplished by the XIth. Navigation Congress has been great and prolific ; we are happy in having been called upon to cooperate in this great work and we congratulate ourselves on the results which have been achieved.

To the organisers of the XIth. Navigation Congress we tender our enthusiastic congratulations. To this illustrious assembly we render the tribute of our admiration. To the representatives of the Russian Government we submit our respectful homage ! To the Russian people we tender the expression of our esteem and most cordial sympathy. (*Applause.*)

THE PRESIDENT. — I now call upon Colonel Ockerson: delegate of the United States, to speak.

COLONEL J. OCKERSON : —

Ladies, Gentlemen,

Those of us who have come from distant land across the sea and have enjoyed the hospitality extended to us by Russia and upon to co-operate in this great work and we congratulate our-coming.

We came fully prepared for a cordial welcome to this country

where the Congress was to be held under the high patronage of His Majesty the Emperor of Russia.

We felt sure that with President Timonoff at the helm, aided by such an able corps of Associates, the success of the Congress was assured.

But even with these expectations we find that you have far exceeded our fondest hopes.

The provisions made for the work of the Congress have been superb.

The excursions by land and sea that you have provided, have been most delightful and instructive.

The entertainment of all kinds that you have provided for us have been most lavish and satisfactory in every respect.

You have given us sunshine and rain and snow, as well as an extravagant amount of daylight. (*Applause.*)

With it all, the deliberations of the Congress will doubtless prove of lasting benefit to the World at large.

We from America feel amply repaid for the journey of 12,000 miles involved in our participation.

We are greatly indebted to the Russian Government, to the city of St. Petersburg, to the local Commission and to the ladies who have been untiring in their efforts for our comfort and pleasure.

With these acknowledgements we now express to one and all our profound and lasting gratitude and our sincere thanks.

We hope that some day we may have the honour and the pleasure of showing our appreciation of our extraordinary hospitality in a more tangible manner by extending to you and all the members of this Congress an American welcome on the other side of the Atlantic. (*Applause.*)

THE PRESIDENT. — I now call upon Baron Quinette de Rochemont, delegate of France, to speak.

BARON QUINETTE DE ROCHEMONT : —

Ladies, Gentlemen,

Having already had the honour of addressing you at the opening meeting, my intention was to confine myself to merely thanking the various persons who have contributed towards the

success of the Congress. The task is an onerous one after hearing the numerous speakers who have rendered these thanks in such a more able manner than I can possibly do. I should, however, be shirking my duty if I neglected to thank my old friend Mr. de Timonoff who, jointly with the Local Commission, has undertaken a heavy task and carried out the organisation of the Congress with such success. The Presidents of the sections have likewise had a heavy burden to bear. Then the Mayor of St. Petersburg and the Minister of Ways of Communication are equally entitled to our thanks, the former for the reception he gave us at the Hotel de Ville, and the latter for the garden party he gave us in addition to the large share he has taken in the preparation work and organisation of the Congress.

But allow me, Gentlemen, to lay stress upon a point which has not yet been commented upon : This is the first time in the history of Navigation Congresses, that a committee of ladies has been formed in honour of members who have come to St. Petersburg to take part in the Congress, and these ladies have been good enough to look after our compatriots with untiring amiability and willingness. I beg to thank these ladies most warmly on behalf of the members of the Congress. (*Applause.*)

I address these thanks more specially to the president Mrs. Schaffhausen-Schönberg-Eck-Schaufuss, who has contributed as much as His Excellency the Minister of Ways of Communication to the success of our gathering. (*Applause.*)

Before concluding, I wish to testify my indebtedness to H. I. H. the Grand Duke Michael Alexandrovitch, who has honoured our opening meeting with his presence and who has been so good as to take an interest in our work by coming to the conservatoire. Also, we tender our respectful homage to H. M. Nicholas II, High Protector of the Congress who was good enough to receive us with such great affability at Peterhof, for which we are truly grateful.

Allow me, in the name of France which is bound to Russia by special ties, to address our respectful homage to him and to exclaim in conclusion : —

« Long live the Emperor Nicholas II » (*Great applause.*)

THE PRESIDENT. — I call upon Mr. Deking-Dura, delegate of the Netherlands, to speak.

Mr. DEKING-DURA : — .

Ladies, Gentlemen,

I am glad, as delegate of the Netherlands and on behalf of my compatriots who have taken part in the Congress, to express our deep gratitude to the Local Organising Commission for its efforts and to express our admiration for the results which it has achieved.

I specially congratulate Mr. de Timonoff, the President of the local Commission who has combined the laborious duties of President, General Secretary and Reporter on this occasion. Only those who have taken part in the preparation of a Congress of this importance can form an exact idea of the amount of work and devotion which are necessary to comply with the multifarious exigencies of these difficult functions.

The cordial relations between Russia and Holland are already of long standing. I need only remind you of the frequent visits paid to us by the Czar Peter the Great, the Founder of modern Russia. These excellent relations have been unbroken ; and they have been further strengthened by dynastic ties and recently by the share which both countries have taken in the peaceful work in which H. M. the Czar has taken the initiative.

My compatriots and I experience great satisfaction in having taken part in this important Congress, which will remain indelibly engraved in our memory.

The great hospitality we have received from the Ministers as well as from the Municipality of St. Petersburg and the Senate of Finland, has impressed us most profoundly.

We also express our great gratitude to H. I. H. the Grand Duke Michael Alexandrovitch who has been good enough to agree to act as Honorary President of the Congress.

But all this has been surpassed by the great and unexpected honour of having been admitted to the august presence of H. M. the Czar and to have been presented to him. (*Applause.*)

THE PRESIDENT. — I now call upon Mr. Farragó, delegate of Hungary to speak.

Mr. FARAGÓ : —

Ladies, Gentlemen,

The XIth. Congress, which has just completed its work, may well be proud of its results, for these testify to the great progress which has been accomplished in the technical sciences and their practical application. And I can assure you that all of us who come from Hungary, will always gladly and gratefully remember the useful work to which it has been our privilege to contribute and I am sure we shall utilise the scientific information which has been collected by the Congress by employing it in the improvement of navigable waterways and of the maritime and river navigation of our country.

The glorious days we have passed amongst you will also remain present in our memory and we shall leave Russia with deepfelt gratitude and tender recollections of the extreme amiability and splendid attention which have been showered upon us everywhere.

One more, Gentlemen, thanks and long live Russia. (*Applause.*)

THE PRESIDENT. — I will now call upon Mr. Maganzini, delegate of Italy, to speak.

Mr. MAGANZINI : —

Excellencies,

Ladies and Gentlemen,

The XIth. Navigation Congress could not fail to be a success after H. M. the Emperor had graciously accepted to act as High Patron to this work and H. I. H. the Grand Duke Michael Alexandrowitch has agreed to become Honorary President. We should, therefore, in the first place render our thanks and respectful gratitude to H. M. the Emperor and H. I. H. the Grand Duke Michael. Our thanks should then be rendered to their Excellencies the Ministers of the Russian Government who have so brilliantly supported the work of the Congress.

The successful outcome of our work and the interesting excursions which we have been privileged to enjoy in this marvellous and especially hospitable country, could not come

as a surprise to anyone of us who knows the extraordinary activity of His Excellency Professor de Timonoff. By combining the functions of President as well as those of General Secretary of the Congress of St. Petersburg, our distinguished colleague has been the soul of a superb organisation which has been exhibited to us under its diverse phases just as the links of a chain are unrolled from an axle under the action of some intelligent force. All our gratitude therefore goes forth to President Timonoff and is addressed at the same time to the organising Committees of the Congress for the victory they have just accomplished. Lastly, we render tribute to the Ladies' Committee which have devoted itself to our compatriots with so much graciousness.

We do not require many words to express our feelings, after our agreeable stay in St. Petersburg, suffice it to say that by coming here — and I see they have come in great numbers — Italians have accomplished one of their most ardent aspirations. We have responded to the call, not only on account of the ever increasing interest with which Italy, now freed from more pressing anxieties, follows all questions which bear upon maritime and fluvial navigation, but we have also responded to the call because at Milan in 1905, we had conceived much esteem and sympathy for many engineers, professors, sailors and hydrographers from your beautiful country. Allow me on this occasion to express all the regret we experience is not seeing amongst us, alas, Mr. Ghercévanoff, whose scientific mind, had been attracted to the enquiry of problems which are of such intense interest to our Italy.

The receptions we have been invited to in St. Petersburg as well as in Finland and at Narva, testify to the sympathetic feelings which exist towards. The sumptuous hospitality we have received in all quarters from your Corporations, your local governments and from everyone has only been exceeded by the frankest cordiality.

Therefore it is a very agreeable duty to me before we part, to testify all our gratitude for the magnificent days we have passed in your midst, and to assure you that on our return to Italy we shall retain a delightful and everlasting souvenir of Russia and of the XIth. Navigation Congress.

Long live Russia and long live Russians. (*Applause.*)

THE PRESIDENT. — I now call upon Mr. T. Okino, delegate of Japan, to speak.

Mr. T. OKINO : —

Ladies, Gentlemen,

This is the first time that, we Japanese, have attended a Navigation Congress in comparatice large numbers. We believe that this circumstance has enabled us better to appreciate the great value of your work, your noble and useful aims, and the moral, and beneficial effect which this Institution exerts upon international relations.

It is hardly forty years since Japan entered the arena of your civilisation. She has therefore to create in the shortest possible time, all the plant of this civilisation and although she has worked and worked with feverish haste, she is still far from having reached the end of her labours. We have much to learn from all that is taking place in those countries which are in the vanguard of progress, and especially where the peace and prosperity of nations are concerned when, moreover, it is the work of eminent men of different races, from various parts of the world who are assembled with the sole object of promoting the general welfare.

The incalculable benefit which will accrue to our country is not the only thing which awakens a great and fervid sympathy in us. This sympathy also arises from this atmosphere of fraternity, cordiality, frankness and loyalty which we have been breathing with full lungs ever since we came among you and which has enabled us to better understand the lofty ideals upon which this great Permanent International Association of Navigation Congresses is based.

Therefore, gentlemen, we shall return home deeply moved and shall speak of you and of your work with the feelings of deepest emotion to our compatriots who will take the same pride as ourselves in contributing to the success and development of this work.

In now bidding you good-bye, in the hope of seeing you again at the next Congress, may I ask you to join with me, in accordance with our national custom, in the cry of « *Banzai* » to welcome our Association and especially the XIth. Congress. (*Great applause.*)

THE PRESIDENT. — I now call upon Mr. Mendès Guerreiro, delegate of Portugal, to speak.

Mr. MENDES GUERREIRO : —

Ladies, Gentlemen,

I have very little to add to the brilliant speeches which have just been made. It is a great honour to me to represent my country at this Congress which has been so well organised and which has completed its work in so brilliant a manner.

I always come to Russia with the greatest pleasure, not only because of the cordial manner in which I am always received, but also on account of the great progress I witness and the efforts which this country makes to introduce civilisation in the most out of the way regions. For this, Russia has a claim to all our sympathies.

I think, gentlemen, we shall all carry away the pleasant souvenir of our sojourn in St. Petersburg. The welcome we have received in all quarters has been most charming. Not only in the capital of the Empire, but also in Finland and especially at Cronstadt where the Imperial Navy has shown us such great courtesy and where we have taken part in sumptuous receptions and have appreciated a perennial frank loyalty and sincere cordiality.

In conclusion, gentlemen, allow me tell you that in Portugal we make the most ardent vows for the prosperity and happiness of Russia. (*Applause.*)

THE PRESIDENT. — I now call upon Mr. Roummel, junior, delegate of the League for the Renewal of the Fleet, to speak.

Mr. ROUMMEL, junior : —

Ladies, Gentlemen,

The delegates of the League for the Renewal of the Fleet have requested me to transmit their most respectful sentiments and thanks to the illustrious and learned members who have honoured the XIth. Navigation Congress with their presence, for the colossal work in which they have been privileged to take part.

There is no doubt that the progress of maritime science and of the arts of navigation in the direction of general welfare of the whole world and of our country is in good hands when entrusted to our Permanent Association. And one of its great merits is that it has called attention to maritime questions which are now of greater importance and urgency than ever they were.

We may be certain that the work of scientific and practical men who are united under the motto of our Association « *Navigare Necesse* » which is of such wide application, will ensure the solution of many questions which deal with navigable waterways, ports, hydrography, etc.

The League for the Renewal of the Fleet which was only founded in 1906, has had the honour for the first time of taking part in the discussion of questions on the agenda.

The delegates of our body, the President, his Assistant and the General Secretary who have taken an active part in the work of this Congress, have done all they could to collect all useful information bearing upon the development of our mercantile marine and of our navy as well as upon the construction of ports, and the questions of armament and navigation requirements.

This being so, we hasten to express our complete satisfaction to the XIth. Congress, at the results which have been achieved and we form the most sincere vows for the success of the future work of the Permanent International Association of Navigation Congresses.

I will conclude by expressing the hope that we shall have the pleasure of seeing you again in great numbers at the next Congress. (*Applause.*)

THE PRESIDENT. — I now call upon the assistant to the Mayor bladh, delegate of Sweden, to speak.

Mr. DEMKINE, Assistant to the Mayor of St. Petersburg thanks the members of the Congress in Russian for having come in such numbers to St. Petersburg and for having collaborated so actively in the solution of many questions of extreme interest to Russia.

THE PRESIDENT. — I now call upon Mr. Fridolf von Wijnblad, delegates of Sweden, to speak.

MR. FRIDOLF VON WIJNBLADH : —

*Your Excellency,
Esteemed ladies and gentlemen.*

In the name both of my colleagues the delegates of the Swedish Government, and the public departments of Sweden and private Societies which are here represented, and likewise on behalf of the Swedish ladies and gentlemen who share the honour and pleasure with us of taking part in the XIth. International Navigation Congress, I beg to express our deep and hearty thanks for the friendly reception which we have met with, for this aimiable welcome and above all for the magnificent hospitality and extraordinary goodwill which has been vouchsafed to us.

We Swedes received the invitation of our neighbours and friends of St. Petersburg to participate in this Congress with pleasure, and we came here expecting great things from our journey. I must admit that our expectations have been greatly surpassed.

According to us this Congress is not only equal to its technical mission but it has a great bearing on the development and extension of the good neighbourly feelings which at present exist between the two nations whose frontiers touch one another, Russia and Sweden, and it will tend to bring about a stronger bond of culture between them.

President Timonoff, we congratulate you and the Committee most heartily on the grand result of your work.

Long live our aimiable Russian hosts and hostesses! Long live St. Petersburg. (*Applause.*)

THE PRESIDENT. — I now call upon Minister Argyropoulos, delegate of Greece, to speak.

MR. ARGYROPOULOS : —

Ladies, Gentlemen,

As delegate of Greece, I associate myself most heartily with the eloquent terms in which the delegates who have preceeded me, have thanked H. M. the Emperor, H. I. H. the Grand Duke

Michael Alexandrovitch, the Committee and especially the President, Mr. de Timonoff.

Ladies and gentlemen, you have all seen that the city was bedecked with flags. You know that Russia celebrates to-day an imperial holiday, the birthday of H. M. the Empress Alexandra Feodorowna. I believe it will meet with your consent and unanimous wish if I ask you to join me in crying « Long live the Empress Alexandra » whose birthday we celebrate to-day in the same breath as « Long live the Emperor Nicholas ». (*Great applause.*)

THE PRESIDENT then declares the Congress closed in the following terms : —

Ladies, Gentlemen,

The work of the XIth. Navigation Congress is now completed. The questions on our comprehensive agenda have been discussed. The sections have submitted to you the minutes of your proceedings and you have just voted the conclusions on the various reports, thereby enhancing the value of these documents, a value which you may all have foreseen on reading the name of their authors and which was completely confirmed on perusal of the reports.

As you have been good enough, gentlemen, to allow me to speak in your name, may I be permitted to address the most sincere thanks on behalf of the Congress to all those who have given our meetings an importance which has exceeded our anticipations.

Our first expression of gratitude will be for H. M. the Emperor, the High Protector of our Congress, who has given us so many proofs of his august goodwill.

We must then thank H. I. H. the Grand Duke Michael Alexandrovitch who kindly consented to act as Honorary President of our Congress and thus facilitated our work.

Then we must thank our other Honorary Presidents, and especially the Ministers of the Interior, of Finance, of Ways of Communication, of Marine, of Industry and Commerce, and of Agriculture, and also the Major of the City of St. Petersburg who is always to be found when there is work involving great and prolific ideas.

Allow me also to express our lively gratitude to those eminent men, and especially to those from abroad, who have been so good as to afford us, either in their reports or during the debates, the benefit of their profound scientific knowledge in so unsparing a manner.

We must not forget also those who have consented to conduct the debates of our sections and have brought to our discussions their enlightened views and the experience acquired in the highest positions.

And without the order and method which they brought to bear in the discussions it would not have been possible to carry out the investigations of the important problems which have been the subject of your debates, in so short a time. May I take this opportunity of assuring them of our gratitude which is also due to the chief secretaries and the sectional secretaries whose intelligence and indefatigable zeal cannot have escaped the attention of any of you.

We should also include the organisers of our Exhibition amongst those to whom our thanks are due, for they have given themselves a great deal of trouble to collect such technical data of interest to you and have exhibited it in our meeting rooms in such a charming and graceful manner.

We must also, gentlemen, send our grateful remembrances to the Cities and Government Departments who have received us in so flattering and hospitable a manner, especially in the case of the magnificent reception accorded to us by the Senate of Finland. We cannot forget those important and powerful establishments of Kroenholm, Nevski and others, when we have been shown all the ramifications of industries which are a source of honour and prosperity to this country. May the care with which they surround their workers receive its due reward in the form of loyalty and devotion.

Lastly, gentlemen, allow me to ask you again to express your grateful thanks to the engineers who organised our excursions and enhanced their pleasure by their good-natured explanations.

Having accomplished this duty, which has been a very pleasant one, I will not fall into the temptation of recapitulating the work that you have done. The conclusions you have just voted are too fresh in your memory to render any such recapitulation at all necessary.

Besides, each country has contributed its quota of information to the wide field of investigation which has been before us. The debates have shown us all the principles underlying each opinion, and you have been able to see the differences of opinion which have existed on several points. For this reason where it has been necessary in the sections to frame a reply which will deal in a broad way with the question under discussion, you have found that in addition to a few principles expressed in a concise form, requests have been formulated for fresh investigations so that wishes have taken the place of formal resolutions. This could not be otherwise as conditions change with progress.

We do not therefore regret the prudence which dictates that the solution of problems of a still indefinite character shall be left to the future.

This is one of the reasons for the permanent nature of our Association. What one session of the Congress cannot settle is carried forward for consideration at a subsequent session, and this continual renewal of our meetings dulls the edge of our regrets at their inevitable breaking up.

Nessun maggiore dolore
Che ricordasi del tempio felice
Nella miseria.....

as Dante says.

We are spared this sorrow for we are assured that the happy times we have spent together will be renewed at the following session of the Congress.

Proud of the honour you have conferred on us by entrusting us with the control of your work, and full of gratitude for this token of confidence, we trust that when you leave us you will take away as precious a remembrance of us as we will retain of you.

With this aspiration, I wish you good-bye, and declare the XIth. Navigation Congress to be closed. (*Prolonged applause.*)

The meeting concludes at 12.30 p. m.

REPORT
OF
LECTURES AND COMMUNICATIONS

REPORT
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Several lectures, of great technical value, were given by members of our Association during the Congress.

These lectures completed and enhanced the work of the Congress and we think it desirable to report them in full, as follows.

***Lecture give by Colonel S. A. Ockerson, Civil Engineer
on : —***

**The proposed navigable waterway between Lake Michigan
and the Gulf of Mexico.**

Colonel S. A. Ockerson, civil engineer, spoke on this subject before a large audience, on Monday, June 1, at 7.20 p. m. in the large hall of the Institute of Engineers of Ways of Communication.

Mr. BRANDT, the Principal of the Institute, introduced the lecturer in the following terms : —

Ladies and Gentlemen,

Mr. Ockerson, of the United States, is going to speak to us on the proposed deep navigable waterway between the Great Lakes and the Gulf of Mexico.

With the approval of this High School, I take the opportunity of expressing our admiration for America and Americans who,

formerly the pupils of Europe, are now our teachers in many respects.

America is a very far-off country, but the wonders of science and art which come to us from them across the seas attract our attention and induce us to study this country and the lives of its great men. This attitude cannot fail to arouse in us the most sympathetic feelings.

Ladies and Gentlemen, Hip, hip, hourrah! for America and the American nation.

Colonel OCKERSON, after thanking Mr. Brandt for his kind remarks about the United States, then gave an account of the principal characteristics of the proposed navigable waterway between Lake Michigan and the Gulf of Mexico.

The following is a summary of his lecture : —

The development of the United States has been so rapid and the requirements of the means of transport reached such a pitch that in 1906, both railways and all those waterways which could be rendered navigable were inadequate to cope with the traffic requirements.

There were about 220,000 miles railway track with 50,000 locomotives and 1,750,000 goods wagons.

In ten years the mileage increased by 21 % whereas the traffic increased by 110 %.

In these circumstances it was estimated that an increase of 25 % in the mileage and rolling stock would be necessary to cope with the commercial requirements of the country during the following five years.

The cost of such an increase would be enormous.

This condition of affairs aroused a feeling in the public mind in favour of a general improvement of navigable waterways which had been greatly neglected during the period of active development of railways.

As a matter of fact no general systematic plan of developing the navigable waterways of the United States had hitherto been drawn up, but the question is now under the consideration of a special commission which will no doubt come to some conclusion in the near future.

The Government has expended 552,943,025 dollars for the prosperity of the United States up to the present.

About 37.7 % of this amount has been spent in improving the navigable waterways and ports of the Mississippi valley.

The basin of the Mississippi covers an area of 1,250,000 square miles. It is by far the most important river system in the United States and is susceptible in a great degree to improvement both as regards the main artery and its tributaries.

A deep navigable waterway, 1,625 miles long, between Lake Michigan and the Gulf of Mexico, is one of the various schemes which have been proposed to supplement the inadequate means of transport which have been referred to.

We will give a brief account of the proposed scheme and will show some of its principal features on the screen.

The scheme comprises a waterway with a minimum navigable depth of twelve feet throughout its length. The project has not yet been officially adopted by the Federal Government but it is under its consideration.

The waterway commences at Lake Michigan and along the Chicago river, through the city of Chicago for a distance of 6 miles, up to the « Sanitary and Ship Canal ».

This canal, about 30 miles long, was built by the Sanitary Commission of Chicago at a cost of about 50,000,000 dollars. It is 22 feet in depth and its width varies from 110 to 200 feet.

It flows in an opposite direction to the waters of the Chicago river which run southwards towards the Gulf of Mexico together with a volume of 10,000 cubic feet of water per second which come from Lake Michigan.

From the end of the drainage canal and for the following 63.5 miles, there is a fall of 136 feet and the improvement will consist of locks and moveable weirs.

The locks will have an available length of 600 feet and will be 80 feet wide and 14 feet deep over the sill. The Chanoine type of moveable weir will be used.

Concurrently with the improvement of the section, it is proposed to obtain water power of 173,000 H. P. nett. The estimated cost is 281,822 dollars per mile.

Then there are 229.5 navigable miles along the Illinois river up to the Mississippi with a fall only 33 feet, or 0.14 foot per mile. The improvement in this section consists of dredging a

canal 200 feet wide at the bottom and at least 14 feet deep, at an estimated cost of 35,676 dollars per mile.

The distance from the mouth of the Illinois to St. Louis is 38 miles. The proposed improvement follows freely the course of the Mississippi for 15 1/2 miles and at that point a moveable weir 2,500 feet long with a difference in level of 14 feet, will be established. Then in order to avoid the complication of the confluence of the Missouri, a canal will be built along the left bank of the river. A lock 600 meters long and 80 meters wide will be built at the lower end of this canal with a difference in level of 38 feet so that navigation will be able to be effected at low water stage for a length of 38 miles.

The canal will only be used during low water stage, the river itself being used as at present at high and mean water stages.

The estimated cost of this improvement is 172,470 dollars per mile.

From St. Louis to the mouth of the Ohio — a distance of 180 miles — there is a fall of 109 feet, or 0.6 foot per mile. The problem of improving the section is complicated by the large amount of silt which is brought by the Missouri river. This section is considered the most difficult to deal with in the whole length of the waterway between the Great Lakes and the Gulf.

A Commission of engineers has been formed to consider this problem but they have as yet not arrived at any definitive conclusions as to the works most suited for these conditions.

From the mouth of the Ohio river to the Gulf — a distance of 1,070 miles — the improvement would consist of levees against floods, the revetment of the slopes to prevent erosion, the dredging and narrowing of the cross section in a few places.

The volume of water at the upper end of this section varies from a minimum of 70,000 to a maximum of 1,600,000 cubic feet per second. There is a depth of 14 feet during at least 6 months in the year. A canal 9 feet in depth or more is maintained by dredging through the sandbanks during low water stages.

The obstacles to navigation are confined to about 45 sandbanks or other obstructions which average more than a mile in length.

Levees against the flood have been built for a length of about 1,450 miles and although they are still far from completion,

they render great service in preventing the damage which arises from floods.

The jetties at the south-western pass which are approaching completion, will give a wide channel, 35 feet deep at low tide, from the river right up to the Gulf. The southern pass where the Ead jetties are built and which has been in use for the last thirty years, has a navigable depth of 30 feet.

Interesting views were shown on the screen after the lecture and were much appreciated.

Lecture by Baron Quinette de Rochemont, Inspecteur des Ponts et Chaussées, on :

Seaports.

The lecture by Baron Quinette de Rochemont attracted a large audience to the Institute of Ways of Communication on Saturday, June 6 at 8.30 p. m. The eminent Inspector-General received a very enthusiastic welcome.

Mr. BRANDT introduced the lecturer as follows : —

Ladies and Gentlemen,

Baron Quinette de Rochemont, Inspecteur général des Ponts et Chaussées of Paris, is going to speak to you on the subject of recent progress in the construction of seaports.

Before he does so, I intend to show you the importance of this, in the history of the Institute of Ways of Communication, of which I have the honour of being the Principal.

Yesterday in talking with Baron Quinette de Rochemont, I learnt that in 1860, when he was still a pupil of the Ecole des Ponts et Chaussées, he attended the course of lectures of the celebrated professor Benoit Clapeyron, the author of a method of calculating the stresses in continuous girders and of the celebrated Clapeyron formula which has been applied to thermodynamics and now is a science in itself.

I then remembered that Mr. Clapeyron had been a professor at our Institute from 1821 to 1830, at the same time as the celebrated Mr. Lamé and Mr. Dufour,

This was the second batch of French professors who had come to St. Petersburg to teach our future Russian Engineers.

Before that, when the Institute was founded in 1810, there had been a series of French professors, Messrs. Sennover, Résimon, Fabre, Posier, Bazaine, Destrem and at the head of these professors was Mr. de Bésancour, the real founder of the Institute, whose bust is in our library and whose portrait is placed at the top of the right hand corner of this door.

In those days the teaching at the Institute was carried out in French and this continued until 1840.

To-day, after a lapse of seventy years, we shall again hear the voice of a French professor, who is himself a pupil of one of the first professors to bring us the benefits of French science.

You see how entitled we are to say that enlightenment has come to us from France.

It still comes to us even in these days ; but to-day like good disciples we may claim our share with French and other foreign engineers in the great work of human progress.

But we cannot forget our French origin and we shall never forget that France, our country of predilection, is also the country from whence came our first teachers.

I ask you, Ladies and Gentlemen, to join me heartily in exclaiming « Long live France and its representatives ».

Baron QUINETTE DE ROCHEMONT, then spoke.

He first of all thanked the Council of the Institute of Ways of Communication for having been good enough to invite him to lecture on a subject of his own choosing, and he then went on to speak of the *changes which have supervened in the conditions of construction and exploitations of seaports*.

The changes, due principally to the alterations which have occurred in the conditions of navigation, led the lecturer to call attention in the first place to the increase in size of ships and the effects of the adoption of marine steam engines.

He also pointed out how navigation methods had been improved and how time was now a chief factor in commercial operations owing to the great expense entailed in the purchase and working of steamers and the quick crossings and rapidity of postal, telegraphic and telephonic communications.

In order to increase the remunerativeness of vessels it is necessary to increase the number of their trips, and to enable them to enter and leave the ports at all hours and load and unload their cargoes as rapidly as possible.

These desiderata led Baron Quinette de Rochemont to refer to the increased coasting trade to the construction of ports in deep water and to the necessity of extending the jetties on each side of the entrance channel into deeper waters, etc., and to the increase in the length of the quays, etc.

Referring to ports in water with a great tidal variation, he pointed out that the necessity of keeping vessels afloat which are not suited to leaving aground, had led to the construction of tidal basins of greater and greater size ; and the same could be said of the locks at the entrance of these basins.

Baron Quinette de Rochemont did not forget, however to point out that the delays which large vessels have to face in entering and leaving tidal basins, and the difficulties and dangers which attend their passage through the locks are such that there is actually a tendency to revert to quays or open basins even when the tidal range is great.

Very useful data was then given on the subject of dry docks and floating docks, on the improvement of the lighting and buoying of coasts and on the methods of working the ports, which have been considerably modified by the adoption of machinery and railway tracks on the quays.

In concluding his very instructive lecture, Baron Quinette de Rochemont took care to point out and give proof that the alterations which have occurred in the conditions of navigation and of construction and exploitation of seaports, had considerably reduced freight charges and thereby increased the traffic.

Lecture by M. Léon Gerard, Electrical Engineer, on : —
Electric haulage in America.

After Baron Quinette de Rochemont's lecture was concluded, Mr. Léon Gerard, late professor at the University of Brussels, showed a series of lantern slides of the great American canals and explained these views.

As professor Merczying, general reporter of the section of inland navigation as regards mechanical haulage of boats, had remarked during the work of the section that no technical information had been supplied on this subject to the Congress, Mr. Léon Gérard remedied this omission by showing views of electric haulage in America on the screen.

Mr. Gérard described succinctly the economic role played by American canals and the imminent revolution which has compelled the Government of the United States to consider the question of improving its navigable waterways as one of primary importance.

In the north of the United States, the Erie canal connects the lakes to the Hudson river and to the port of New-York ; the complete transformation of this colossal waterway is now commenced. In the centre, the canal system of which the Lehigh canal is a typical specimen, connects the inexhaustible coalfields of Pennsylvania with the ports of Philadelphia and New-York. In the west, the junction of the Mississippi system with Chicago by means of the Discharge canal, which has been described in an interesting lecture before the Congress by engineer Ockerson, will soon enable one of the most important traffics in the world to be effected between the Great Lakes and New Orleans.

The Morris, Lehigh Valley, Delaware, etc., canals are old canals of small section. The increasing congestion of the railways entails the reconstruction of these canals some of which have fallen into the hands of the railway companies which competed with them.

A series of typical lantern slides show the methods of loading by machinery, the working of the locks and the methods of supplying these canals with water and of increasing their size without interfering with the traffic.

Mr. Léon Gerard showed on the screen the evolution which has taken place in the appliances for electrical haulage since 1897; — the Gaillot electric horse which runs without rails along the towpath — the Köttgen apparatus on the Finow Canal (1898) which runs with one wheel on rail and one without rail on the tow-path — the Léon Gerard locomotive with two moveable rails, described at the Düsseldorf Congress of 1902 — the Köttgen apparatus with unsymmetric loading, adopted on the Teltow canal (1904) — and lastly the Léon Gerard apparatus with mechanical adhesion to a Clarke monorail, which was described at the Milan Congress of 1905 and tried on the Erie and Lehigh Canal.

The Lehigh Coal and Navigation Company has carried out comparative trials of mechanical haulage on a section of 4 miles of canal, which will follow upon the eventual widening of the of canal which will follow upon the eventual widening of the cross section of the canal and the reconstruction of its locks. These trials have given very interesting results and have led to fresh progress in the form of an improvement by which the four wheels of the apparatus which bear upon the monorail have been converted into driving wheels by a set of levers worked by the haulage itself.

The series of lantern slides showed all the applications of electric haulage and especially the systems employing mechanical adhesion which enable small light engines to be employed, whereas haulage systems which are based on greater adhesion require a dead load equal to five times the maximum starting effort.

The excellent lanterns of the Imperial Institute and the nature of the hitherto unpublished photographic views which were shown on the screen, contributed largely to the interest of this improvised lecture.

Communication by M. Luigi Luiggi, Inspecteur Général du Génie civil italien, Professor of Maritime Works at the Royal Polytechnic School of Rome, on : —

Repairing appliances for large vessels.

The paper by Professor Luiggi on the first communication of the second section (repairing appliances) could not be submitted in the form of a pamphlet, so it is given as follows : —

For vessels of medium tonnage, that is to say those below 2,000 tons burden, it is still an open question whether slipways are not the best method. In fact they still offer a simple and economical solution of the problem of dry docking vessels, thanks to the adoption of electric windlasses and steel cables for haulage purposes.

But for vessels of large tonnage these appliances are unsuitable and even dangerous owing to the unequal stresses to which the hull is exposed.



Floating dry docks or still better, fixed dry docks, give better results and deserve our particular attention.

A few years ago these floating basins were looked upon as *makeshifts*, as one would say in English, or at least they were considered in the light of temporary expedients ; latterly, however, their adoption has received a great impetus.

From basins with a *lifting-power* of 5 to 10,000 tons we have arrived rapidly to 15, 16 and 18,000 tons, as for instance in the case of the Pola (Austria), Algiers (New Orleans) and Manila (Philippines) docks.

And now we have sprung right up to 35 and 37,000 tons with the two docks which Germany is about to complete for the repair of vessels of the *Lusitania* type which the Hambourg America Company and the North German Lloyd Company are building.

But floating docks, even with all their present improvements, are still *make-shifts*.

Repairs are slow and very expensive, and even the arrangements for dry-docking the vessel are attended with danger.

For instance, if a floating dock can be quickly and cheaply constructed, the cost of up-keep is high and with every possible care, the life of such a dock is only about forty years.

The opinion of Italian engineers on this question is that floating basins of the self docking type are the most suitable in the following cases : when the bottom is very bad, as at Venice, New Orleans, Rotterdam, Hamburg, or when the water is very deep and even *too great* for the foundations of a masonry dock, as at Pola, Fiume or Valparaiso, or where it is necessary to organise quickly the means of repairing large vessels, as at Genoa in 1870 with the old timber floating dock (since destroyed) or else where naval reasons dictate as recently at Manila and the Bermudas ; or where the initial outlay must be limited even at the expense of higher working expenses.

There are only two floating docks in Italy for large merchant ships, excluding the small basins in the arsenals for torpedo boats and submarines. These two docks belong to private firms and are of the following dimensions : —

	Genoa	Venice
Length over keel blocks	78.10 meters	110.27 metres
Available width	16.84 »	20.00 »
Lifting power	2,900 tons	5,000 tons
Time taken in lifting	30 minutes	60 minutes

Type : « out-rigger », « double sides », « self docking dock ».

These basins are built of steel and have only been in use for a few years with, however, good results.

Generally, however, preference is given everywhere to fixed docks built of masonry and occasionally of wood.

For a few *dozen* floating docks in the world there are *hundreds* of fixed ones.

The predominating type is the masonry basin or the concrete one faced with masonry. The basins built in timber some years ago in America, when wood was very cheap, are tending to disappear and to be generally replaced by masonry ones.

The characteristics of modern basins is their great size, which is due to the enormous progress in naval construction for commerce and war.

Whereas in 1896-1900 a basin 222 metres long, 27 metres wide and 10.50 m. deep over the entrance sill, like the one built at Bahia Blanca (Argentina) by the author, was the largest in the world and was considered like the slightly smaller ones of Devonport and Nagasaki, suitable for future requirements, we find now these basins are quite inadequate.

Much larger vessels are already in use and naval constructors are proposing to build vessels 1,000 feet long, 100 feet wide and 40 feet draught.

Basins 250 metres long have already been built and repairing docks are now being constructed which are almost of the dimensions indicated above.

It has just been decided to build two masonry basins in Italy of the following dimensions : —

TARENTO

(in construction).

Available length over keel blocks	180 metres (1)
Width at entrance	30 »
Depth at entrance	13 »
Time taken in emptying	2 1/2 hours

VENICE

(now being tendered for.)

Available length over keel blocks	200 metres (2)
Width at entrance	32 »
Depth at entrance	12.50 »
Time taken in emptying	2 1/2 hours

Both these basins have been designed to allow of future extension if required and the necessary ground has been reserved with this object.

(1) Capable of future extension to 253 metres.

(2) Capable of future extension to 250 metres.

All the present dry docks in Italy are built in lime and pouzolane concrete, faced with stone and granite, and they are closed with floating gates which are raised automatically.

	NAME OF PORT	Date of opening	Available length(1)	Width at entrance	Depth at entrance at mean water level	Resident or consulting engineer
			Metres	Metres	Metres	
1	Genoa A . . .	1849	89.00	17.40	6.60	Col. Sauli.
2	» N° 1 . . .	1893	105.00	25.00	9.50	Parodi. Giaccone. Luiggi.
3	» » 2 . . .	1892	200.00	18.00	8.50	
4	» proposed	—	305.00	32.00	12.00	
5	Spezzia N° 1 . . .	1869-76	105.00	21.50	9.15	Gen. Chiodo. Gen. Grassi. Col. Pestalozza.
6	» » 2 . . .	»	126.00	23.60	9.15	
7	» » 3 . . .	»	126.00	23.60	9.15	
8	» » 4 . . .	»	105.00	21.50	9.15	
9	» » 5 . . .	1885	200.00	32.70	10.10	
10	» » 6 . . .	1890	156.00	27.40	10.10	Mati-Inglese.
11	Leghorn . . .	1865-90	134.00	23.30	7.00	
12	Naples A . . .	1852	76.00	18.40	7.20	Rava. Caizzi. Bernardini.
13	» N° 1 . . .	1906	112.00	21.00	7.00	
14	» » 2 . . .	in construction	200.00	26.00	10.30	
15	Messina . . .	1875	100.00	21.00	8.00	Luiggi. Verdinois.
16	Palermo . . .	1906	165.00	26.00	8.50	
17	Taranto N° 1 . . .	1888	205.00	31.00	10.00	Col. Cugini.
18	» » 2 . . .	in construction	180.00	30.00	12.00	Col. Monaco.
19	Venice N° 1 . . .	1880	90.00	17.00	6.00	Col. Cugini.
20	» » 2 . . .	1882	115.00	23.70	8.50	
21	» » 3 . . .	in construction	200.00	32.00	12.50	Col. Moneta. Ing. Luiggi.

(1) By available length we mean the actual length required to dry-dock a vessel of that length.

The views prevalent in Italy on the subject of dry docks which being built by the Government have to conform to the requirements of the navy as well as of merchant ships, may be summarized as follows : —

a) The entrance must be at least 28 metres wide, but preferably 30 and even 32 metres ; the walls to be very slightly *inclined* from 1 to 15 to 1 to 20, and the sill to be from 10 to 12 metres below the level of mean tide ;

b) The interior of the dock must be as plain as possible, with three or four large side altars and four or five small altars at the end ; the *available* length over keel blocks to be about 220 metres with the possibility of increasing the length to 250 or even 300 metres eventually ;

c) The ladders at the entrance and at the end of the dock are considered to be sufficient but it is necessary to provide many vertical ladders along the whole length of the dock for the sailors. Inclined planes are useless and even dangerous, and it is far better to use travelling cranes for lowering the materials. One of these cranes should be at least a 20 ton crane ;

d) It is advisable to divide the dock into two or three sections by floating gates which can be raised and revolved ;

e) The best means of closing the dock is to employ a semi-floating gate which can slide into a lateral recess (Bahia Blanca and Barry dock) and which can be opened or closed by machinery in two or three minutes or by hand in eight or ten minutes. As this method of closing the entrance is rather costly, a cheaper method can be adopted by using a floating gate which opens and closes automatically. There are no examples in Italy of mitred gates for closing dry docks and they are moreover considered inferior to floating gates ;

f) It should be possible to empty the dock in two or three hours by means of horizontal centrifugal pumps which are placed in a sump and worked by steam or by dynamos where this is feasible ;

g) Wooden keel blocks can be used for warship ; keel blocks of cast-iron and wood are preferable for merchant ships ;

h) To build kitchens, baths and W. C's around the dock for the use of officers and crew ; instal mains for drinking water, fire and electricity which can be connected up with the docked vessel so that it may be as well protected and under the same

hygienic conditions as if it were at sea and its machinery at work ;

i) To provide ample space around the graving docks for yards and repairing sheds.

These views which have only been partially followed out in the most modern Italian docks, have been adopted in full in the naval dry dock of Bahia Blanca (Argentina) which though it may not be the largest in the world, can be considereed as one of the most important and most complete.

Mr. Lewandowsky gave a lecture on : **Russian Navigable Waterways.**

This lecture was followed by a paper by **M. Bormann** on : **Thermal engines used on board inland navigation craft.**

The text of these lectures has not been handed to the Executive bureau of the Association so that they cannot, unfortunately, be reproduced here.

CONGRESS EXHIBITION

Exhibition had been held at Frankfort, Manchester, The Hague, Paris, Düsseldorf and Milan which were a great value and added to the interest of the Navigation Congresses.

Russia would not in this or any other respect fall short of the task it had undertaken in inviting representatives and specialists from all parts of the world to meet at St. Petersburg.

Russia has assembled together a magnificent collection of exhibits, unsurpassed anywhere in abundance and value, for the benefit of the members of the Congress : marine charts, road maps, traffic diagrams, statistics, text works and nautical publications, circulars, technical works, meteorological observations, albums of triangulation, soundings, surveys of lakes, seas, rivers, hydrographical explorations and models of lighthouses, ice-breakers, lighters, bridges, dams, locks, photographs, nautical instruments, compasses, anemometers, etc.

We enumerate these exhibits below : —

List of exhibits lent by the Department of Roads and Navigable Waterways.

SECTION I

Publications

1. Publications issued by the Department of Roads and Navigable Waterways : —

1. Records of the water level of inland waterways in the Russian Empire, taken at hydrometric stations which have been installed from 1881 to 1890 inclusive by the Ministry of Ways of Communication.

Vol. I, Basins of the Baltic and White Seas, published in 1901 : —

a) Text ; *b)* Maps and diagrams.

2. Ditto. Vol. II, Basin of the Caspian Sea, 1907 : —

a) Text and tables ; *b)* Maps and diagrams.

3. Ditto, from 1891 to 1900 (inclusive) Vol. IV, Basins of the White and Baltic Seas : —

a) Text and tables ; *b)* Maps and diagrams.

4. German Lloyd. Regulations concerning the construction of boats for river and lake navigation. Iron and steel boats. Translated by engineer Borman, 1902.

5. Researches on the means of increasing the water supply of the upper Volga, by engineer Bouchmakine, 1902, part I : —

a) Text ; *b)* Atlas.

6. Ditto. 1904, Parts 2 and 3 : —

a) Text ; *b)* Atlas.

7. Records of observations at hydrometric stations. The Volga. Samara hydrometric station. Edited by Kolo-miitsoff, 1889.

8. Ditto. Doubovskoé hydrometric station, 1902.

9. Project of mechanical haulage on the Ladoga canals.

10. Contribution to the discussion on the subject of hydro-electric plant, by Maximoff, engineer, 1905.

11. Calculation of the area of Russian Asia, with indication of the basin areas of the oceans, seas, rivers and lakes, and of the divisional governments in the reign of the Emperor NICHOLAS II, by A. A. Tillot, 1905.

12. Appendix to the latter work : charts of basins of the oceans, seas, rivers and lakes of Russian Asia and contiguous regions, on a scale of 100 versts to the inch.

13. Chart of the navigation of the Chilka from the town of Sretensk to the town of Nicolaevsk, on a scale of 100 sagenes to the 0.01 sagene.

Explanations appended by Staritzky, engineer, 1905.

14. Chart of the navigation of the Amour between Khabarovsk and Nicolaëff, on a scale of 1 verst to the inch.

15. Chart of the navigation of the Soungari, from the town of Kharbine up to the Amour, on a scale of 250 sagues to the inch.
16. Construction of waterways under unfavourable conditions of site and water supply, by Pouzyrevsky, engineer of ways of communication, 1907.
17. Motor boats exhibited at the Berlin Automobile Exhibition of 1906, by Borman, engineer.
18. The Dniestr. Description of this river and project improving it. Report by Pouzyrevsky, Engineer, 1902.
19. Navigable waterway of Obi-Iénisséi and its economic importance, by Ibikovsky, engineer, 1903.
20. Appliances for dredging rivers. Text and plates by Borman, engineer, 1903.
21. Typical works for consolidating the banks of canals, rivers and lakes. Vol. I, text. Vol. II, plates ; by Polkovsky, engineer, 1903.
22. The Oka and the Moscow-Nijninogorod waterway, by Pouzyrevsky, engineer, 1903.
23. Project for canalising the southern Donetz, by Pouzyrevsky, engineer, 1904.
24. Winter quarters for craft on the Volga and the Kama. Text and maps, by the staff of the Department of Ways of Communication of the Kazan division 1906.
25. Bar of the Amour and lower reaches of this river, with a succinct description of the neighbouring seas from the point of view of the economic development of the maritime territory. Parts I and II, text and plates, by Tchoubinsky, engineer, 1905.
26. The Baltic to the Black Sea waterway (western Dniepr-Dvina). History and actual condition of this waterway, based on data in the Ministry of Ways of Communication, 1906.

The following are appended to the above work :

a) Short description of schemes drawn up by the Ministry of Ways of Communication for the various sections of the waterway, 1906, and *b)* Account of an expedition to the sources of the Dniepr, by Graftio, engineer.

27. Ice-floes on the Neva, by Lokhtin, engineer, 1906.
 28. The Soungari, from its origin up to its confluence with the Amour. Part I, description ; Part II, tables ; Part III, plates ; by Rodévitch, engineer, 1906.
 29. The River Zeïa. Text and maps by lieutenant general Bérézovsky, 1906.
 30. The River Amgoune. Text and maps by lieutenant general Bérézovsky, 1906.
 31. The River Bouréïa. Text and maps by lieutenant general Bérézovsky, 1906.
 32. The River Selemджа. Text and maps by lieutenant general Bérézovsky, 1907.
 33. Account of the navigable waterways of Siberia, 1906.
 34. Lower reaches of the Amour, from Khabarovrk to Nicolaevsk, engineer, 1907.
 35. Contribution to the question of improving the middle Don between the villages of Kazanskaïa and Katchalinskaïa in the territory of the Cossacks of the Don, by Legoune, engineer, 1906.
2. Map of the hydrometric stations within the jurisdiction of the Administration of the Department of Roads and Navigable Waterways.
 3. Work of the Congresses of Russian scientists on navigable waterways for the years 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1904.
Papers, communications, accounts of meetings and reports containing the enumeration of the questions which have been the subject of reports to the said congresses and also containing the decisions of the latter.
 4. Bulletins of the St. Petersburg division of Ways of Communication. Parts I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV et XV.
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SECTION II.

**The Principal Waterways of European Russian
and their navigation.**

The Dniepr.

5. Panel showing a bridge over the Dniepr at Kief.
6. Model of dyke erected during the blasting operations in the bed of the river.
7. Relief plan of the Nénacitetsky.
8. Plan (drawing) of the Nénacitetsky.
9. Four plans in relief of the shoal of the Roudiaki-Staïka, showing the river currents as indicated by submarine current vanes.

10. *The Dniepr and its basin*, work by N. J. Maximovitch, engineer of Ways of Communication.

11. Drawing of a drilling vessel.

This vessel is for drilling rocks below water, to enable dynamite cartridges to be inserted by means of which the rock is removed in the channel of the Dniepr, near the cataracts.

This appliances comprises a pair of Ingersoll drills (American patent) placed on four trucks which roll on a platform which is guided by four wooden uprights down to the river bed and maintained in position.

In order to carry the boat, it is necessary to lower the platform by screw jacks and place it on two small wooden lighters which are connected together by horizontal beams. The average work of a pair drills is about 30 metres of holes, 1 1/2 inch in diameter (0.038 m.) in the rock bottom of the river. The cost of a drilling vessel is about 15,000 francs.

These appliances were first used in 1897.

12. Drawing of a boat for extracting and raising stones from the bed of a river.

This appliance is for removing stone and gravel extracted from the beds of rivers by blasting by means

of dynamite and for conveying them to other boats. This work is being carried on near the cataracts of the Dniepr. The weight of stones which can be removed by this appliance is as much as 5,000 kilogrammes (300 pouds).

13. Atlas containing plans and sections on a reduced scale of the Dniepr from Smolensk up to Liman.

14. Photographs : region of the shoals of the Dniepr ; works for removing the rocks in the channel ; port of the town of Kief ; views and works of the Desna.

The Volga below Rybinsk.

the section from Nijni-Novgorod to Vassilsoursk.

16. Panel with views of the Volga and map of the «Téliatchy Brod » (Calves Ferry).

17. Panel with map of the Volga near Nijni-Novgorod.

18. Up-to-date map of the Volga from Rybinsk to Nijni-Novgorod, with water-colour paintings of cities, town and villages on the route.

19. Atlas containing maps of the Volga from Rybinsk to Kazan.

20. Model of a goods barge.

Capacity, 7,500 pouds ; draught, $7\frac{1}{4}$ archine ; draught when empty, 7 verchoks. These barges are nearly always towed by steam tugs.

21. Ditto. Barge for the transport of horned cattle. •

Length 234' ; width 40' ; height of gunwale 3'3" (to top of masts 25'). Can carry from 700 to 1,000 large horned cattle and up to 5,000 pouds of hay, so that the total load is about 30,000 to 35,000 pouds. The draught when fully loaded is $8\frac{1}{2}$ quarter archines ; when empty it is $2\frac{1}{2}$ quarter archines. This barge is larger than those used for grain and other goods.

22. Ditto. Barge for the transport of timber (with hoops « douga »).

Length 224' ; width 43' ; height of gunwale 10' ; with flat bottom. These barges are destined especially for the

transport of sawn lumber or other cut and prepared or other cut and prepared timber. Their tonnage is 20,000 pouds. The draught when fully loaded is 5 quarter archine, and when empty 6 verchoks. They navigate on the middle Volga.

23. Ditto. Barge for the transport of naphtha products.

Length 175'; width 36'; height 13'. The body is solid like ordinary barges but has partitions. The object of these partitions is to prevent the naphtha from overflowing into the body when the barge is pitching. These barges are no longer constructed in wood but are built in iron and are of a larger capacity.

24. Ditto. Barge for iron. Dimensions : 175' × 30'4" × 10'6".

Complete load : 60,000 pouds with a draught of 14 1/2 quarter archines ; when empty : 2 1/2 quarter archines. Same type as ordinary goods barges. Are towed by tugs all along the Volga.

25. Ditto. Paousok.

A barge 121' in length, 27' in width and 5'6" in height. Built like the ordinary barge type. Rounded at the stern like steam tugs. Draught 10 quarter archine when loaded with 15,000 pouds, and 9 1/2 verchoks when empty.

26. Ditto. Soura barge (« Sourskaïa »).

Length 84'; width 28'; height of gunwale 6'6". Complete load 10,000 pouds with a draught of 3 quarter archine and a draught of 4 verchoks when empty. Although this barge resembles (ordinary barges) in its general appearance, its length does not exceed 15 to 18 sages. It is generally roughly built of common material. They carry flax on the Soura and on the Volga in the downstream direction.

27. Ditto. Beliana.

This is the largest river craft and is halfway between the boat and the raft ; it is used for floating timber. They are only built to serve for one journey and are neither tarred nor painted so that they have a white appearance from afar whence their name beliana (bely

= white). They are built on the tributaries of the Volga and of the Kama from whence the logs are floated. They are used for one trip and after the timber is unloaded, they are sold to be demolished and used for building purposes. When demolished the belianas are transported from the ports of the lower Volga on to the Don where fresh craft are built for traffic on the sea of Azov. These beliana are distinguished by their large size and great load capacity. They are 50 sagues long, 10 sagues wide, draw 24 quarter archines and carry 500,000 pouds. Accommodation is provided fore and aft for crew and provisions. From one to four small peasant dwellings called « isbas » are placed on the toploads, to be sold at the various ports of call all ready for occupation.

The beliana are navigated with by the lead and have the rudder at the stern like all craft which is navigated in this way.

28. Ditto. Kama boats or semi-beliana.

These boats are built on the Kama and also on the Volga.

They are smaller than the beliana. Their load varies from 10,000 to 100,000 pouds.

29. Ditto. Steamboat *Ekaterinbourg*, belonging to Lubimoff.

Dimensions : length 165', width 28', height of gunwale 10'3". Draught, when running with full boilers, 100 pouds of full, crew and complete fittings, 5 quarter archines and 1 verchok. The displacement under these conditions is 28,208 pouds. Capacity of hold : 3,500 pouds of naphtha for fuel ; 189 tons of goods forward and 153 tons of goods aft.

Carrying capacity for passengers : 1st. class, 55; 2nd. class, 51 ; 3rd. class, 4 cabins for 40 persons ; 3rd. class, on deck, 550 persons.

Steam engine power 800 IHP.

30. Ditto. Watercolour drawing of a Beliana.

31. Ditto. Albums of views on the Volga.

32. Ditto. Photographs of ice breaker in the winter quarters of Sormovo, on the Volga.

Navigable Waterways

which connect the basin of the Volga with that of the Baltic Sea.

33. Map showing plan and longitudinal section of the Marie navigable waterway, in its present condition.

34. Comparative longitudinal sections of the Marie navigable waterway, as modified from time to time.

35. Maps showing the plans of the Marie, Tikvin and Vychnii-Volochok, navigable waterways.

36. Comparative longitudinal sections of the Marie, Tikhvin and Vychnii-Volochok navigable waterways.

37. Plan of the Ladoga canals showing the position of the lighthouse in course of construction on lake Ladoga.

38. Album showing the chief engineering works on the Marie system, in chronological order.

39. Two albums of plans for the reconstruction of the Marie system, the works of which were completed in 1896.

41. Photographs of the Neva and of the Ladoga canals.

42. Album of views of boats which are used on the Marie system and on the Neva. Published by the St. Petersburg division of ways of communication.

43. Album of types of boats which are more frequently used on the Marie system.

44. Model of lock on the Emperor Peter the Great canal : —

This lock, built at Schlusselfurg at the old end of the Ladoga canal, has replaced the wooden lock built under Peter the Great. The scheme for a granite lock was made by engineer Bazin. The first two lock chambers were built and opened to traffic in 1826. The construction of the two other lock chambers and of the basin and swing-bridge over the lock were commenced in 1828 and completed in 1836. It is interesting to note that hydraulic lime made with Volkhov limestone was used for the first time in this work. The base of the lock walls rest upon an invert on piles. The walls are masonry slabs faced with granite. In order to save water, the lock chambers are connected together by a double set of transverse pipes which are fitted with

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A view of the Navigation Exhibition (Palace of the Conservatoire).

sluice-valves. Each lock chamber is 175 feet long by 30 feet wide. A lock takes from 5 to 7 minutes to fill, according to the water level. A basin has had to be provided between the lock and the swing bridge in order to side track craft going down toward the Neva or passing by the swing bridge which connect the two parts of the town of Schusselburg.

45. Model of the *Mariinka* boat : —

Length 144'8" ; width 28' ; hight 7'10" ; complete load 18,000 pouds with a draught of 8 quarter archines and of 4 verchoks when empty. Lightly built. Navigates on the Volga and Marie system ; hence its name. The « *Mariinkas* » are actually built on the Volga, Cheksna, Kovja, Matoma, Andoga, Choumla, Mologa and Siti. Dimensions of the *Mariinka* : from 15 to 20 sagues in length and 3 to 4 sagues in width. Capacity from 15 to 20,000 pouds. Draught from 6 to 8 quarter archines.

46. Model of craft, called a *Poloulodok* : --

Navigates on the Marie system. This type of boats comes within the category of solid construction and its shape is commensurate with its speed.

Length from 15 to 25 sagues ; width from 3 to 4 sagues ; capacity from 15 to 20,000 pouds, with a draught of 7 to 10 quarter archines.

47. Model of craft, called a *Polouberlina* : - -

Length of body 115' ; width 22' ; height of gunwale amidships 7'7" (including masts 14'). Are built on the Mologa. Capacity 18,000 pouds ; draught 8 quarters ; empty 6 verchoks. Carry salt, flour, grain, stone, planks and iron. Navigate on the rivers and canals of the Marie system.

48. Model of craft, called *Tikhvinka* : --

The *tikhvinka* are from 5 to 25 sagues long and have different names, according to their size. For instance, up to 10 sagues they are called *Kanavka* ; from 10 to 18 sagues *Méjéoumok* and above that length, *Poloulodok*. These three sizes of *tikhvinka* are of the same type and construction. They navigate on the Volga,

the Oka and the Marie system. This type of boat was first built for navigation on the Tikhvin system, from which they derive their name and they have subsequently been adopted on other systems and rivers. Those used on the Svir are considered the best. The length of the tikhvinka varies from 5 to 25 sagues, the width from 2 to 4 sagues, capacity from 2,000 to 3,000 pouds with a draught of 3 to 9 quarter archines.

49. The Vychnii-Volotchok system. Raised plan of part of the course of the Msta at the Borovitchi rapids : —

The length of the portion reproduced on the plan is 1 1/2 verst with a general slope of 3 1/2 sagues. The plan shows : *a*) stone packing of 100 sagues in length ; *b*) a crib dyke of 100 sagues in length with ice-breaker ; *c*) a dangerous strip of land on the right bank, with semaphore ; *d*) two inverts under water with an area of 270 square posag ; *e*) a open work cage on the bank ; *f*) spring buffers on the engineer Karitsky system ; *g*) life-saving station ; *h*) watchman, shelter ; *i*) ladder for descending into the cage ; *j*) lime-kilns ; *k*) yard for making spring buffers ; *l*) barges crossing the shoals in the channel.

50. Model of spring buffer, engineer Karitsky system : —

These are placed at sharp bends in the river Msta ; they deaden the blows of the barges as these strike the banks. The unpact on the buffers causes them to bend and as they expand they thrust the barge into the channel again. Each section is 18 sagues long. Some of these appliances are placed along a stretch of 450 sagues at the Msta rapids.

51. Panel showing the reservoir of the upper Volga :—

The Oka, the Moskva, the Téza and the Don.

52. Panel containing views and plans of the Oka and the Moskva.

53. Album of photographic views of the Téza and the Don.

54. Album of collotypes showing the canalised portions of the Moskva.

55. Album of plans of projects of canalisation which have been carried out on the Moskva river.

56. Model of a *Poloubarka* barge : —

This type of barge navigates on the Oka, the Volga, etc., and is built chiefly on the Oka. They are used preferably for the transport of glass, for firewood, crockery, stones, iron, etc. They differ from other barges of the type by their simple and cheap construction and also by their great size. The body is generally slightly built and can only be used for 5 or 6 trips and sometimes only for one. The larger sizes of these barges are known by the name of « barka ». The barka and poloubarka are from 5 to 45 sagues long (more often 13 to 30 sagues) and from 1 1/2 to 9 sagues wide. For a draught of 3 to 20 quarter archines they can carry from 1,000 to 60,000 pouds. The barges are either propelled with oars or are towed.

57. Atlas containing plans and sections to a reduced scale of the Oka.

The Duke Alexander of Wurtemberg Navigable Waterway.

58. Plan and sections of the system.

59. Model of a wooden lock : —

A wooden lock with a single lock chamber with an internal lift wall. The lock is founded on piles as will be seen from the model. The part of the invert at the upper part and lower ends of the lock between the mitred gate and the lift wall and the parts between the hollow quoins, have a double floor of bricks laid in hydraulic mortar. The walls of the lock chamber are built in two parts : the lower part which is always submerged is in the form of caissons and the upper part is made of horizontal girders between two uprights to which they are bolted. This method of building lock walls is adopted with a view to replacing the upper part without having to touch the lower part. The walls at the head of the lock are built in the form of caissons for greater strength. The caissons are filled with gravel and coarse sand.

The Vistula.

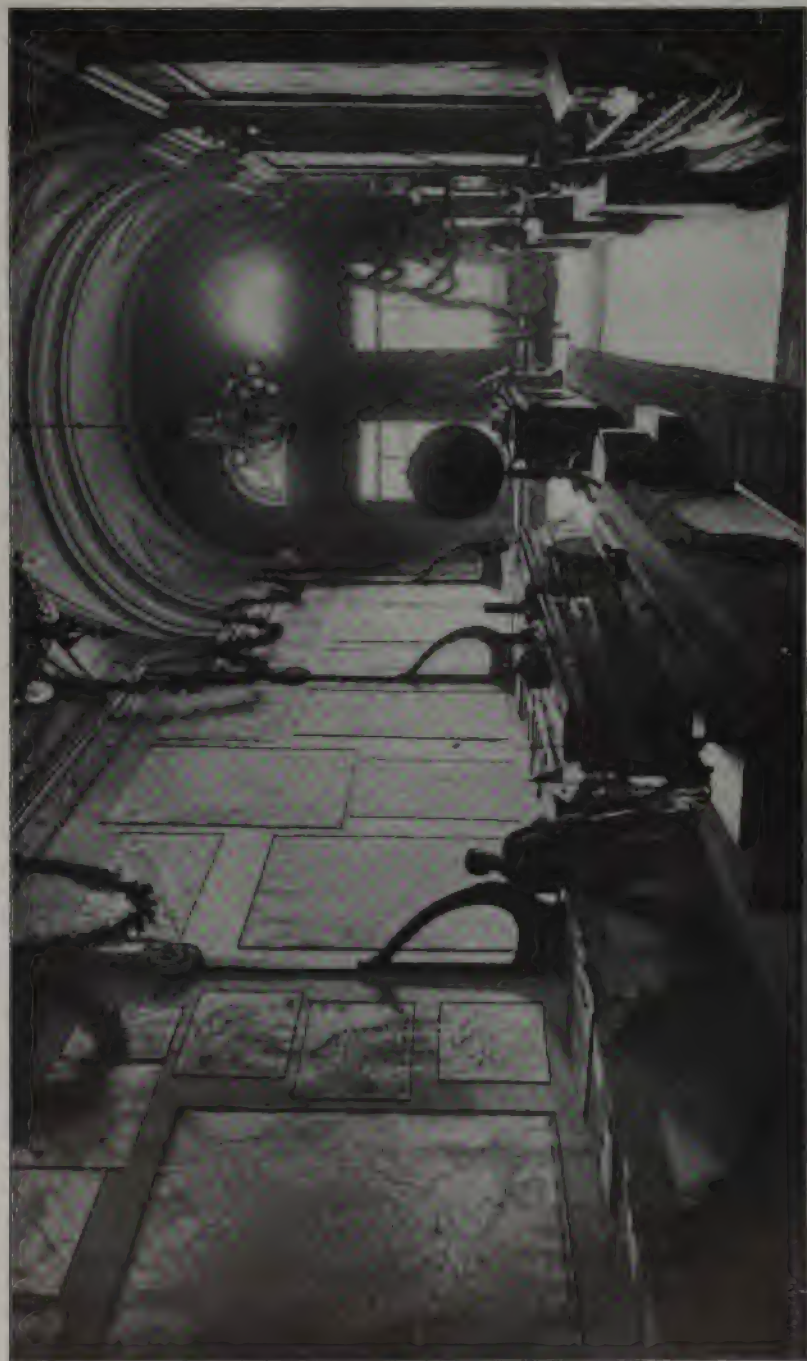
- 60. Panel with views and plans of the Vistula.
- 61. Plan of the Vistula throughout its course in Russia (shown on two cartoons).
- 62. Model of a *Barka* barge : —
This large flat-bottom craft with sails is used on the Vistula. It is also found in other waterways.
- 63. Models of fascine works :
These models represent typical training works used in improving the Vistula at Warsaw, between 1885 and 1896, in order to ensure the necessary depth for the drainage and waterworks of the city and to render the Vistula navigable above Warsaw. These models show:
 - a) Details of fascine works ; willow cables, single and double rows of piles, heavy fascines and method of making fascine mattresses ;
 - b) method adopted in Holland for placing fascines ;
 - c) fascine dyke and
 - d) consolidation of banks by fascines.
- 64. Description of works on the Vistula at Warsaw : —
Text and album of designs of civil engineering works.

SECTION III

Principal Waterways in Siberia

- 65. Map of Siberia showing waterways in actual use and projected.
- 66. Plan and section of the Obi-Ienissei waterway.
- 67. 5 photographs of the Obi-Ienissei canal.
- 68. Album of photographs of the Obi-Ienissei navigable waterway.
- 69. Album of photographs of the Ienissei.
- 70. Album of drawings of barges which navigate on the rivers belonging to the Ienissei basin.

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A view of the Navigation Exhibition : Maps and Statistics (Palace of the Conservatoire).

- 71. Album of photographs of the Irtych.
- 72. Album of photographs of the Obi.
- 73. Album of photographs of the Tomi.
- 74. Model of *First* and *Second* steam tugs ordered for navigation on the Angara river.

Whilst the works of improving the navigable conditions of the Angara were being carried out from 1894 to 1899, two exactly similar steam tugs with light draught, high speed and 600 IHP. each were ordered from the Armstrong works in England. These vessels known as *First* and *Second* were safely conveyed by the navigator Vigins from England to the mouth of the Ienissei via the Arctic Ocean and the Sea of Kars.

The length of the vessel is about 27 sagues, the width 3.55 sagues with 6.57 paddles. Draught five quarter archines.

- 75. Model of the *Khanka* steamer : —

Bought for the requirements of the construction of the Transsiberian railway and owned by the Post and Telegraph Department of the Amour territory. Built in 1896 by the firm of Yarrow & Co. of London. Navigates on the Amour, the Chilka and the Oussouri. This vessel is of American type with light draught and paddle wheel at the stern. The boilers, engines and passenger cabins are on deck, the hull being used for cargo. The hull is of steel, and is 17 sagues 1 archine long and 3 sagues 1 archine 5 verchoks wide. The draught when empty is 3 quarter archines 1 verchok. Load it can carry 2,500 pouds. It is worked by a paddle wheel which is revolved by a two cylinder engine of 200 IHP.

- 76. Watercolour of the *Khanka* steamer.

- 77. Model of the *Baikal* raft ice-breaker : —

This is used to convey the Transsiberian trains across lake Baikal between the landing stages of Barantchouk and Mysovaïe. It was built in sections in 1896 at the Armstrong works in England, and was sent in this form to the village of Listvennitchnoe (on lake Baikal) where it was put together and launched in 1899. The

ice-breaker which is strongly built of Martens steel is designed to break the ice when steaming ahead or astern. Its greatest length is 290 feet, width 57 feet, draught forward 18 feet, draught aft, 20 feet, speed 20 1/2 verstes an hour. Displacement when completely loaded, 4,200 tons. The ice-breaker has three triple expansion engines with a total 3,750 H. P. Two engines, placed aft, are separated by a bulkhead; they move the ice-breaker by means of two screw propellers aft. One engine, placed forward, works the forward screw propeller which assists in breaking the ice. The hull is covered with steel plates one inch thick below the water line. There are three tracks of rails on the main deck of the raft ice-breaker which run in the direction of the axis of the craft and can accommodate 25 trucks loaded with merchandise. There are cabins for 150 passengers of all three classes on the upper deck. A special saloon is reserved for first class passengers. When the ice-breaker is going full speed ahead it can break through four feet of ice. It covers the distance between Barantchouk and Mysovaïa (64 versts) in 3 to 4 hours during summer and in 6 to 10 hours during winter.

78. Watercolour of the *Baikal* raft ice-breaker.

79. Album of drawings of navigation signals for use in the basin of the Amour.

80. Guide to the rivers in the basin of the Amour.

81. Two albums of photographs showing types of barques, barges and steamers, and views of the Amour and the Chilka, of the ice channel and of typical fogs.

82. Album of steamers of transport and plant used in the basin of the Amour.

83. Album of types of rowing boats used in the basin of the Amour.

84. Models of rowing boats used in the basin of the Amour.

85. Specimens of trees used for the construction of boats navigating in the rivers of the basin of the Amour.

SECTION IV

Dredging.

The following ninety-one dredgers of various types and of a theoretical efficiency of 0.5 to 150 cubic sagues of excavation per hour, are employed to extract the deposits in the channel with a view to ensure the continuity of navigation on the system of inland navigable waterways in Russia during the period of very low water.

These dredgers belong to the following types : —

Dredgers with single buckets	32
" " long distance delivery	18
" " pumping buckets	9
" " " and suction pipe	24
Suction dredgers	6
Spoon dredgers	2

The cost of these 91 dredgers representing a total theoretical efficiency of 1,329 cubic sagues per hour, is about 9,185,000 roubles.

All this plant has been built during 45 years ; during the first thirty years from 1862 to 1892, 21 dredgers were built with a total efficiency of 65 1/2 cubic sagues per hour at a cost of about 750,000 roubles. From 1892 to 1908, 8 1/2 millions roubles have been spent for the construction of 70 dredgers of a total efficiency of 1,263 1/2 cubic sagues.

Out of all these dredgers only 34 were built in Russia, the remaining 57 being ordered abroad. Since 1899, the Government has ordered its dredgers exclusively from Russian works.

The combined efficiency of these dredgers amounted in 1907 to 1,037,000 cubic sagues of material dredged and conveyed to the given site. The cost of this dredging averages 2.65 roubles per cubic sague.

These dredgers are stationed at various portions of the navigable network, but they are chiefly used on the main waterways, rivers and canals : such as the Volga, the Dniepr, the Amour, the tributaries of the Obi, the Marie system of canals between the basins of the Volga and the Neva, etc.

86. List of dredging appliances placed at the disposal of the

department of Roads and Navigable Waterways up to January 1, 1906.

87. Album of types of dredging appliances used by the Department of Roads and Navigable Waterways.

88. Diagrams showing output of some dredging appliances.

89. Model of the Vernodon suction dredger : —

Built by the « Howaldswerke » works at Kiel, Germany, in 1896, for works on the Volga. The hull of the dredger made of mild steel plates and is divided into four compartments by watertight bulkheads. Dimensions : length 40 metres, width 6.75 m., and draught 0.64 m. (when fully loaded). The dredger is self-propelled by means of two side paddles and travels at a speed of 6 versts per hour. The blades are worked by a set of conical pinions. There are two blades which are shaped like the screw of a ship's propeller. This dredger can extract 150 cubic metres of neat sand in one hour at a depth of 3 metres below water level, and at the same time it can force the sand in the pipes for a distance of 200 metres and to a height of 2.13 m. above water level. There are a set of capstans on deck near the well fitted to the same frame and worked by a 20 H.P. engine. In addition to this engine there is a main 150 H.P. engine which works the paddles, the pump and the blades (all these parts work separately).

90. Model of a Lindon V. Bets suction dredger : —

Two dredgers on this pattern were built in 1899 by the « Cockerill » works (in Belgium) for use on the works of the Volga. It is one of the most powerful suction dredgers in Europe. It is provided with Lindon V. Bets blades the cutters are fixed to the perimeter of moveable vertical cylinders and floating pipes. The two dredgers can work in conjunction and be firmly connected to one another. They are self-propelled and have special machinery for navigating in conjunction with additional side screw propellers or with piles driven into the river bed. They can pierce sand banks and are designed to discharge the dredged material into the water at the side where the wind does not blow

MINISTRY OF MARINE.



A view of the Exhibition of Hydrography (Palace of the Conservatoire).

or to empty the sand into the current on each side of the channel. The output per hour for a layer 3 1/2 feet thick with a discharge pipe 700 feet long, is 300 cubic metres and for a layer 2 feet thick, it is 1,500 cubic metres. The depth of suction varies from 0 to 14 feet. The hull of the dredger is of mild steel with a double bottom and is divided by watertight bulkheads into four compartments. Main dimensions : length 210 feet, maximum width 31 1/2 feet, maximum draught, with the tanks full of naphtha fuel and with boilers, pipes, pumps, filters, coolers, all filled with water, 4'3". The dredger has the following plant : a) two triple expansion vertical steam engines of 1,375 H.P. each. These engines work to centrifugal pumps fitted with separate suction and force pipes and separate disintegrating plant; b) a vertical steam engine of about 600 H.P. which works a dynamo. The latter furnishes the requisite power to motors which work the four screw propellers of the dredger, the capstans, the end screw propellers, the force pipe, the steering gear and also provides the necessary current for electric lighting. The steam engines are provided with four tubular boilers which are heated with naphtha fuel.

91. Model of the *Voljskaia* dredger : —

Eleven dredgers of this pattern have been built by the « Werf Conrad » Company for work on the Volga, the Dniepr and Western Siberia. Their output per hour is 250 cubic metres. Distance to which they can force the dredged material, 200 metres. Bucket capacity 0.4 cub. m. Depth of dredging 4.75 m. Draught 1.10 m.

92. Models of the *Sibirskai I* and *Sibirskai II* dredgers : —

Length 42.03 m., width 7.45 m., draught 1.07 m. These are bucket dredgers. Output per hour for sandy and clayey soil, 250 cubic metres. The combined power of the two engines is 250 H.P. Built by the « Werf Conrad » Company at Haarlem.

93. Model of the *Voljskaia 20* spoon dredger : —

Length 28 metres, width 10.25 m., draught 0.86 m. Output per hour 100 cubic metres. Nature of the ground

estimated : sandy and stoney. Combined power of the two engines 400 H. P. Built at the works of the « Sor-movo » Company at Nijni-Novgorod.

94. Photograph of the appliances and their parts.

95. Comparative plotted maps of shoal sand levels taken at the time of dredging.

SECTION V.

Projects for Artificial Navigable Waterways.

96. Project of canalisation of the northern Donetz. Plans of A special pamphlet has been issued which gives a brief explanation of this scheme.

97. Project of the Don to the Volga canal by Léon Dru : —

In 1885 a company, financed by French and Russian capitalists, was formed by Léon Dru to carry out an idea which has already been mooted at the time of the Tartar domination and taken up again under the Emperor Peter the Great. This idea was to connect the Volga to the Don at the point where they are closest together, namely at Kamichine. After carefully examining all this district, the engineer Léon Dru selected Tsaritsyne and the direction to be that of the Volga-Don railway. The cost of constructing the system of canals under this scheme was estimated at about 28 million roubles. The canal was to be designed to accommodate barges 30.5 sagues long, 6 sagues wide, 1 sagene draught and 32,000 pouds capacity. There were 33 locks, of which 12 were on the Don side and 21 on the Volga side. This scheme was not carried out, as serious doubts arose as to the feasibility of being able to supply the canal with water. There is at present a new scheme by a group of private contractors which provides the necessary water supply by pumping it from the Don. The exhibit shows the plan in relief of the district between the Volga and the Don and the longitudinal section of the canal taken through its axis.

98. Project of a junction canal between the western Dvina and the Dniepr : —

The junction canal between the western Dvina and the Dniepr forms one section of the proposed waterway between the Baltic and the Black Sea.

An examination of district around the dividing line between the western Dvina and the Dniepr shows that the best line for the canal is that of Loutchessa-Orcha, that is to say by the river Loutchessa and then in the direction of the town of Orcha.

The canal consists of a dividing reach 19 versts long with one section about 5 versts long, with 11 locks towards the Dvina and another section about $2\frac{1}{2}$ versts long, with 3 locks, towards the Dniepr. The dividing reach is supplied with water by two lake-reservoirs, the Oriékhovsko and the Babinotvitchsko which are provided with dams.

The bottom of the dividing reach is horizontal for a length of 16 versts, and the depth of water in the canal is 1.10 sagene. Beyond the horizontal section, the bottom of the dividing reach has a slope of 0.01 sagene in 1 verst, on each side.

The cross section of the canal is as follows : width at the bottom 14 sagues, minimum radius 30 sagues. The banks in the submerged portion have a slope of 3 : 1 and have a berme at the water level. Above the water level the banks have a slope of $2\frac{1}{2}$: 1.

The figures show the types of locks. Width of gates 6.5 sagues. Distance between the mitre posts 39.45. Pressure on the gates 1.50 sagene. Time taken by a barge to pass through a lock, $\frac{1}{2}$ a hour.

The cost of the works, excluding administration expenses and contingencies, is about 17 million roubles.

99. Project of the Pskov-Jourieff (Dorpat)-Narva navigable waterway : —

The problem was how to establish an uninterrupted fluvial communication between the towns of Pskov, Jourieff, Narva and the Baltic Sea.

With this object in view, the Department of Roads and Navigable Waterways sent a party of engineers under

engineer Koenig to survey the site. Very careful surveys of the Velikaïa, Embach and Narova rivers were made in the period 1902-1904 and after working out their technical details, a preliminary scheme was elaborated in 1905 in which various alternatives ways of dealing with the problem with the supply of water now available from the rivers which has been surveyed, were considered and compared. Fundamental technical conditions to be complied with : depth of channel 10 feet below lowest water (about 14 feet below average water level) minimum width of channel in the river and canals, 15 sagues. Available length of locks, 32 sagues ; width, 6 sagues.

This scheme provides : 1. As regards the river Velikaïa, the deepening of the channel especially in the delta at the bar of the mouth of the river in the lake of Pskov. Approximate cost of work, 119,000 roubles ;

2. As regards the river Embach, the deepening training and cleansing of the channel at various points and especially at the mouth, at the bar of the lake of Tchoudskoé. Approximative costs of works 280,000 roubles ;

3. As regards the river Narova : *b*) deepening operations from the outlet of the lake to the Verkhovsky rapids, complete canalisation of the Verkhovsky and Olguine Krest (Croos of Olga) rapids by means of two dams and locks at Olguine Krest and complete canalisation of the Omoute rapids by means of a stone dam and one lock (total cost of these works 1,944,000 roubles) ; *c*) local dredging operations from the village of Omoute up to the town of Narva (250,000 roubles) ; *d*) avoidance of the cataract of Narva and its rapids which have a total fall of 9.06 sagues, by means of a canal on the right bank with two locks with a deep fall or seven locks with a small fall. (Cost : from 3,149,000 roubles to 3,710,000 roubles) ; *e*) dredging operations and construction of landing stages, also at Narva, 50,000 roubles.

In addition to this main alternative of the scheme, various other alternatives were considered for each section, but they were all more costly. Among the various types of structures proposed, those in which reinforced con-

crete is applied to the locks, are worthy of note. The total cost of the works in this scheme is estimated to amount to 7.7 millions roubles.

The author of the project does not confine it entirely to the interests of navigation as the benefits would not be sufficient to recompense the investment of such a large amount of money ; he raises the question of the practical utilisation of the waters in the basin of lake Tchoudskoe. He lays stress upon the desirability of considering the question of navigation in conjunction with the artificial regularisation of the water supply of the Narva at different periods of the year by using the waters of lake Tchoudskoe as a reservoir so as to regularise the variations in level of lakes Pskovskoe and Tchoudskoe, which as a matter of fact now flood a large area of excellent ground every year, and also of utilising the water power of the rapids and falls of Narova.

The calculations relating to these questions lead the author to think that an undertaking of this kind would be advantageous and necessary for the interests of local navigation, of rural economics and of industry.

SECTION VI.

Various Exhibits.

100. Model in relief showing the channel of a river as indicated by poles.

101. Album of photographs of the river Pripiat, taken from a balloon.

Models of historical craft.

102. Boat belonging to the Emperor Peter the Great : —

Small one-masted craft given by the English to the Czar Alexis Mikhaïlovitch and found by Peter the Great in the village of Ismaïloff, near Moscow. By the Emperor's instructions the boat was dry-docked and fitted with mast and sails and then launched on the Yaousa

and conveyed to lake Pereiaslavskoe. It is in this boat that Peter the Great first went on the sea and became enamoured with the latter; it led to the creation of a Russian fleet. In order to perpetuate the memory of the great importance of this boat, for prosperity, the Emperor christened it the « Grandfather of the Russian fleet » and organised a fete in 1723 to celebrate the occasion. This was held with great ceremony in the roadstead of Kronstadt in the presence of the whole Russian fleet. The boat has been placed, since 1722, in the fortress of Peter and Paul, at St. Petersburg.

103. The *Plaisir-Yakhta*, pleasure yacht belonging to the Emperor Peter the Great : —

The Emperor Peter the Great navigated the environs of Astrakhan in this boat in 1722 and reviewed the Caspian Sea fleet before its departure for the Persian campaign. Tradition relates that the carvings on this yacht were actually made by the Emperor himself. Actual dimensions : length 2 archines 2 verchoks. The actual boat is preserved at Astrakhan.

104. The *Strog Moskvoretsky* galley : —

The Emperor Peter the Great and the Empress Catherine I, Aleksievna, journeyed together on this boat from Moscow to Astrakhan on their way back to Tsaritsyne. Actual dimensions of the boat : length 20 sagues, width 3 sagues, 7 verchoks.

105. *Raschiva* (a kind of decked barque) : —

These barques were in use just before steamers made their appearance and after 1860 they were superseded by barges which were designed to be towed by steam tugs. The origin of the construction of *raschiva* is obscure, but there are indications that these barques were being built on the Volga as far back as 1790. They went down the river empty and were either propelled by sails or by oars when they were made to split the water with the oars, whence their name of splitters (*raschiva*). They ascended the river loaded and were propelled either by sails or towed. The hull of the *raschiva* is so built as to offer the least possible

MINISTRY OF COMMERCE AND INDUSTRY.



A view of the Navigation Exhibition : Maritime Works (Palace of the Conservatoire).

resistance to the water, and the shape has been perfected through the long experience and competition of ship builders. Dimensions : from 15 to 25 sagues in length and from 4 to 4 1/2 sagues in width. Load from 10,000 to 25,000 pouds ; draught 13 quarter archines.

106. Towing engine worked by horses : —

This engine was first invented in 1814 by the Frenchman Poix de Berde and improved in 1819 by the peasant Soutyryne, by the engineer Rebi and by the Englishman V. Fock. Before steam navigation came into use, it was used to tow heavily-loaded boats against the current. It consists of a drum which is revolved by 50 or more horses going in a circle and around the drum a cable is wound, one end of which is attached to an anchor which is dropped about one and a half verst ahead of the boat. Whilst the cable is being unwound at the other end, another anchor is dropped further ahead, and so on. Cargo representing a load of upwards of a million pouds could be conveyed for a distance of 30 verst per day, by means of these engines. They are now no longer used with the exception of some small ones which are kept at Nijni-Novgorod and at Rybinsk for towing trains of barges. Length of the craft 37 sagues, width 7 1/2 sagues.

107. Capstan : —

The capstan played the same role on the above engine, but in this case a steam engine was used instead of horse-power. It was fitted with driving wheels which, however, were only used for steering purposes and for going down with the current. The capstans could accomplish from 30 to 50 versts per day and convey loads up to 800,000 pouds. Instead of being carried as towing barges, the anchors were carried on small steamers called *Zabeszki* (sprinters).

108. The Koulibine engine, worked by hydraulic power : —

This craft was invented by the celebrated Koulibine a self-made mechanic and native of Nijni. This apparatus was tested in 1804, as to its practicability of ascending the current. It was purchased by the State

in 1806, by order of the Emperor Alexander I. The current turned the wheels which revolved a drum around which a cable attached to the towing anchor was wound, and in this way the boat was hauled along. Dimensions : length over deck, 16 sagues and 14 sagues 2 archines at bottom ; width amidships 4 sagues.

109. Plans and elevation of the first steamer built in 1815.

110. Album of drawings of artificial navigable waterways built and projected prior to 1832.

111. Account of the precautionary measures taken against the outbreak of cholera in 1904-1905 on the navigable waterways in the district of ways of communication of Kazan.

112. Photograph of medical observation stations on the Volga and Kama.

113. Photographs of self-propelled craft belonging to the Department of Roads and Navigable Waterways.

List of Exhibits from the Department of Maps and Statistics.

1. Map showing contemporary period of frost and thaw and duration of navigation on the navigable waterways of European Russia. Scale 40 versts to the inch.

2. Map showing contemporary period of frost and thaw and duration of navigation on the navigable waterways of Asiatic Russia. Scale 100 versts to the inch.

3. Thaw and frost and average duration of navigation on the rivers, lakes and canals of European Russia, as also the time when the ice breaks up in the spring or begins to form in the autumn, for the years covering the period 1883-1902.

4. Boat construction in the period 1895-1905 and the traffic at the principal water stations in European Russia.

5. Development of the transport and length of journeys for goods carried by the ordinary fleet of steamers, of the consumption of fuel and of the cost of transport in 1875-1905.

6. Map of railways and inland navigable waterways of European Russia, divided into provinces. Scale 25 versts to the inch.

7. Map of railways and inland navigable waterways of Asiatic Russia, divided into provinces. Scale 100 versts to the inch.

8. Map of ways of communication in European Russia showing the chronological order in which the railways were built. Scale 50 versts to the inch.

9. Map of railways, waterways and roads in European Russia. Scale 40 versts to the inch. 1907 Edition.

10. Map of railways, waterways and roads of Asiatic Russia. Scale 100 versts to the inch. 1908 Edition.

11. Map of inland navigable waterways of European Russia. 1908 Edition.

12. Map of railways, inland navigable waterways and roads of European Russia. Scale 150 versts to the inch. 1908 Edition.

13. Map of ways of communication of European Russia. Scale 300 versts to the inch. 1905 Edition.

14. Collection of diagrams showing graphically the goods traffic on rail and on inland navigable waterways of European Russia in 1880-1905.

15. Plans showing intersections and termini of railways and inland navigable waterways.

16. Atlas of detailed and abridged drawings showing the longitudinal sections of the districts containing the rivers which have been surveyed.

17. Statistics collected by the Ministry of Ways of Communication, relating to the year 1905.

Part. 86. with general information relating to navigable waterways.

Part 87. with data concerning the goods traffic on navigable waterways.

Part 88. with data concerning railways.

Part 89. with data concerning goods traffic.

18. Journal of the department of maps and statistics of the Ministry of Ways of Communication.

19. List of inland navigable waterways in European Russia. 1907 edition.

20. List of inland navigable waterways of Asiatic Russia. 1895 edition.

21. Rivers fleet of European Russia, compiled from the 1900 census. 1902 edition.

22. River fleet of Asiatic Russia, compiled from the 1900 census. 1902 edition.

23. List of steamers in European Russia, compiled from the 1900 census. 1902 edition.

24. List of ordinary boats in European Russia, compiled from the 1900 census. 1902 edition.

25. Crews on ordinary steamers in European Russia and the basins of the Ob and Amour, compiled from the 1902 census. 1904 edition.

26. Atlas of statistics of the ways of communications of Russia, at the beginning of the XXth. century. 1902 edition.

27. Statistical summary of inland navigable waterways of Russia. 1908 edition.

28. Historical sketch of the development of institutions and works coming within the jurisdiction of ways of communication, according to the statistical data and chart of ways of communication in 1798-1898. 1898 edition.

29. List of editions published by the Department of Maps and Statistics in the Ministry of Ways of Communications. 1908 edition.

List of Exhibits from the Department of Agricultural Improvements.

1. Raised map of Baraba showing the drainage of marsh lands.

2. Raised map of canalisation works in the central zone of the government of Riazan.

3. Raised plan of the « Kamenka » irrigation in the district of Bakhmout, in the Ekaterinoslav Government.

4. Raised map of canalisation works carried out by the Government of Minsk.

5. Raised plan of the irrigated « Valouika » lands belonging to the State and situated in the province of Samara, in the district of Novouzensk.

6. Raised map of drainage works carried out in the basins of the Swedi, Ferdianka, and Wedretza rivers in the Government of Minsk.

7. Raised map of the Pinsk marsh lands and their drainage.

**Ministry of War,
Military Topographical Department
of the General Staff.**

The exhibits shown by the Military topographical department, are divided into the following three groups : —

1. Instruments for determining astronomical points and for geodesy.
2. Surveying and levelling instruments.
3. Instruments for making plans and maps.

LIST OF INSTRUMENTS EXHIBITED

FIRST GROUP.

1. A Repsold vertical sextant, 259. Russian make. For determining geographical latitudes and checking chronometers. With tripod.
2. Repsold vertical sextant, 220.
3. Freiberg zenith telescope.
4. Repsold universal instrument, 212, for very accurate triangulation and all astronomical work.
5. Hildebrandt universal instrument, 250.
6. Hildebrandt universal instrument, 266, for secondary triangulation. Project of a military topographical department.
7. Heyde theodolite, 361.

In most of the above instruments the cross wires are lighted by small electric lamps so that these appliances include an accumulator, ampèremeters, voltmeters, etc.

8. Two Ch. Erickson chronometers, 62 and 551.
9. Chronograph.
10. Chronometer.
11. Instrument for the measurement of bases, Carpenter wire, with blocks, microscopes, supports, tripods, etc.
12. Kern combined theodolite and level, 228 for tertiary triangulation.
13. Parrot barometer, 301.
14. Aneroid barometer, 308.
15. Reading barometer, 283.
16. Reading thermometer, 85.
17. Hypsothermometer, 118.
18. Psychrometer, 140.
19. Instrument for fixing telescope wires, 11.
20. Instrument for testing levels.

SECOND GROUP.

1. Plane table 342, with accessoires.
2. Plane table 317.
3. Longimeter 279, used by the Department of Military Topography.
4. Longimeter.
5. Fore-sight.
The above instruments are designed and built by the department of Military Topography.
6. Kern compass, 565.
7. Stephan compass, 486.
8. Schmalkalder compass, 193.
9. Zeiss longimeter, 65, with tripod.
10. Zeiss telescope, 6120, with folding tripod and three revolving lenses.
11. Busch field glass, 218.
12. Busch field glass, 470.
13. Prismatic set square.
14. Chain with rods.

15. Steel straight edge, 398.
16. Steel straight edge, 18.
17. Level 31 and stand used by the Department of Military Topography.
18. Two fore-sights, 33 and 34.
19. Standard meter at Geneva, 96.
20. Standard measure with compass.
21. Pedometer.
22. Two compasses.

THIRD GROUP.

1. Pantograph with crane suspension.
2. Amsler planimeter.
3. Arithmometer.
4. Curvimeter.
5. Co-ordinatograph with cast iron frame, designed by the Department of Military Topography in order to plot out the various points on the plane table from the co-ordinates.
6. Case of mathematical instruments.
7. Copper straight edge and ordinary set squares.
8. Copper straight edge and set square.
9. Copper straight edge and parallel ruler.
10. Copper straight edge and set square with micrometer screw adjustment.
11. Ordinary magnifying lens.
12. Stand for, 11.
13. Folding magnifying lens.
14. Magnifying lens on stand.
15. Stand for tables (logarithms, tables of heights, etc.).

In addition to the above instruments, the Department of Military Topography exhibited various publications, monographs, charts, plans, etc., and amongst others an atlas containing plans of the site of St. Petersburg from 1700 up to the present day and a map of the ways of communication of European Russia (scale 10 versts to the inch) occupying a space of 114 square metres and

covering the whole of the drop curtain of the great hall of the Conservatoire. The separate sheets of this map were joined and mounted together by second Captain I. N. Ivanina, the delegate of the Department of Military Topography.

The exhibit of the Departments of Commercial Ports and of the Mercantile Marine of the Ministry of Commerce and Industry, where shown in the library which they completely filled. The plans of commercial ports and of the most typical maritime works of Russian ports, diagrams and statistical tables of the mercantile marine and traffic of ports, were shown on the large panels of the library. Models of jetties and quays of several Russian ports, of marine dredgers, of warehouses with elevators, etc., were also shown there. Two large panels contained a picture and drawings of the *Ermak*, the largest Russian ice-breaker. More than seventy different publications issued by the Department of Commercial Ports and of the Mercantile Marine were exhibited on the tables. This same hall also contained exhibits in the form of diagrams, photographs, works by the pupils, etc.

RECEPTIONS AND EXCURSIONS

**Excursion on the Teltow Canal on the 28th. May 1908
and journey from Berlin to St. Petersburg.**

In order to give the members of the XIth. International Navigation Congress who were passing through Berlin on May 28th., on their way to St. Petersburg, the opportunity of visiting the interesting Teltow Canal, recently completed at great expense, the German Delegation, headed by the Under Secretary of State of the Ministry of Public Works, Baron von Coels von der Brügghe, and Superior Counsellor Sympher, had organised an excursion in their honour to the Canal and on its waters; notification of this was sent by circular on 6th. May 1908 to the Members of the Congress.

About 120 members assembled on Thursday, 28th. May, at 8.30 a. m. at the corner of Friedrich and Behren Streets where special cars awaited them on the main line of the Berlin Tramways. It was necessary first to go towards Tempelhof and from thence, by the Canal, towards Mariendorf, and then to come back by Steglitz, Gross-Lichterfelde and Teltow towards Klein-Machnow where lunch was to be partaken of, thence, by Neubabelsberg, and passing before Potsdam one arrived at Wannsee where one could take the train to Berlin.

At half-past eight, in the midst of a brilliant sun, the cars of the electric tramway traversed the southern portion of the capital of the Empire, passed through the camp for military manoeuvres and reviews of the garnison Berlin, in the direction of Tempelhof, to the port of the Teltow Canal, where the visitors were received by the representatives of the Teltow district, by the manager and superintendent of the Sievers buildings, by retired frigate-captain Jacob, by the syndic of the Braumüller district, by architect Landsberg and by chief engineer Wüg. Mr. von Achenbach, the district manager, was prevented from attending.

The port installation and the large warehouse which is being built at a cost of over 1,500,000 marks, provided with electric elevators, were first visited. The party then went on board a steamer placed at their disposal by the Teltow district in order

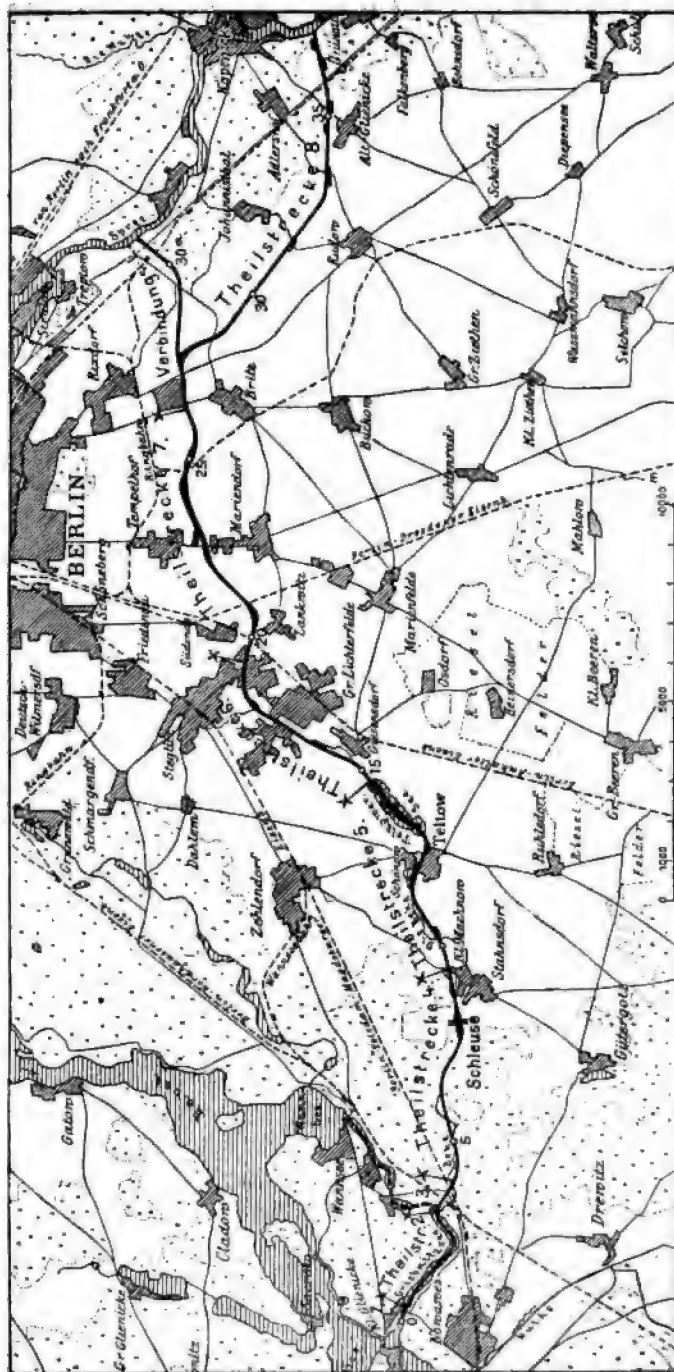
to visit the canal and its plant during a journey which would last several hours. The manager and superintendent of the Sievers buildings gave us the necessary information and we reproduce below some of the data which is of general interest.

For 40 years past it had been intended to open up the navigable waterways on the south side of the city and to establish a shorter line of communication between the Sprée and the Havel, when the energy of Mr. von Stubenrauch, the former district superintendent, who had chiefly in view the drainage of the districts in the south of the capital, succeeded in bringing about a decision to construct a drainage and navigable canal. It was decided in March 1900 to commence building a canal at the sole expense of the district, for which the firm of Havestadt & Contag had prepared plans, and in 1901 the works were commenced and lasted until 1906. This canal, excluding the lateral canal of 8 kilometers, is 37 kilometers long and has cost about 40 million marks. It has the same dimensions as the large canals which have recently been built, such as the Rhine to the Weser Canal and the large navigable waterway from Berlin to Stettin, so that it is navigable for the largest standard boats of the canal which are 65 metres long, 8.5 wide, 1.75 draught, and 600 tons burden. The canal commences at Klein-Glienicke, near Potsdam, and ends at Grünau, near Köpenick (see plan).

The normal width of the canal basin is 20 meters; the depth of water is 2 1/2 meters in the middle and 2 meters at the sides; the cross section of the canal is trough-shape. The headway under bridges is 4 meters. There is a tow-path 2 meters wide at a level of 1.8 to 2.7 meters above the ordinary water level. Small electric locomotives run upon this tow-path; they are built by the firm of Siemens & Halske and are of a special type like the locomotives which work by adhesion with a continuous current of 550 to 650 volts.

These locomotives have a tractive force of 1,200 kilogrammes at a speed of 4 kilometers, and are able to tug two ordinary western boats or four Finow boats. The district has the monopoly of traffic. It takes about 10 hours to go from one end of the canal to the other, including the passage through the locks.

The generating station has been built at Teltow by the Teltow district, not only to provide power for the above mentioned haulage, but also for working the lock of Machnow, and also for the use of industries which have been established along the



MAP OF THE TELTOW CANAL.

canal bank. This station is able to provide 2,300 HP. and may eventually be able to supply 20,000 HP. The works for the production of the current are so built that they furnish the continuous current for the western section of the canal whereas the eastern section, starting from Britz, is supplied by the current from a sub-station.

With the exception of the current required for hauling the locomotives the continuous current is transformed for all other



Fig. 1. — Bridge in Babelsberg Park.

usages into an alternating current and conveyed by high tension cables to various collecting stations where it is transformed into low tension current.

Whilst these explanations were being given we had arrived at the Steffens & Nölle Ironworks which have large cranes ; and at this point the steamer turned round in order to traverse the most interesting portion of the canal. En route we crossed two trains of barges which were being hauled, and we were able to see the method of traction adopted for these barges and the rais-

ing of the cable by means of the mast fixed on the locomotive. The slopes of the canal are consolidated by rows of piles more or less long, and the revetment consists of rough-casting of stone or concrete slabs.

Special difficulties were encountered in the construction of the canal in the neighbourhood of Steglitz and Gross Lichterfelde, and these were only overcome after much trouble and at great expense. The soil of the valley of Beke, where the operations



Fig. 2. — Bridge on the Köpenick-Grimau road.

were being carried out, was muddy and marshy and had to be raised by tipping sand upon it and then dredging it. It was often necessary to remove the mud for a depth of 17 to 20 feet and this required a large number of dredgers and pumps and 42 locomotives and 1,330 wagons for removing the spoil. Where the work was heaviest 6 dry dredgers were used capable of excavating 120 to 150 cubic meters per hour, and 10 suction dredgers with a capacity of 40 to 60 cubic meters per hour, 9 pumps for raising, suction and forcing each with a capacity of 40 to 60 cubic meters per hour and 800 HP. engines.

The removal of masses of mud and marshy earth required that large quantities of sand should be brought to the site. For each lineal meter of canal in the Steglitz Gross-Lichterfelde district, from 250 to 300 cubic meters of sand had to be tipped on each bank.

Local conditions, with one exception, did not allow of the construction of heavy arch bridges, and for this reason steel bridges were adopted with vertical loads. During our journey we saw a great number. They were the continuation of 46 large roads and pathways, of nine railway lines with a total of 20 tracks, and, in addition to these, there were a large number of foot-bridges. Their artistic aspect was not neglected. (See Figs. 1 & 2.)

The cost of construction was as follows : —

a) For the Teltow Klein-Glienicke-Grünau canal, including the Britz-Kanne junction canal, the cost amounted to 39 million marks which was divided as follows : —

	Marks
Purchase of land	8,850,000
Earthwork	12,550,000
Consolidation of banks	1,470,000
Structures	9,000,000
Bridges	790,000
Interest on capital employed in construction . . .	3,300,000
Plant of working	970,000
Direction of works, administration and general expenses	2,070,000
Total. . .	39,000,000

	Marks
b) For purchasing plots of land	2,363,000
c) For electric towing.	2,518,000
d) For the electric sub-station	1,272,000
e) For sheds and warehouse at Tempelhof	1,580,000
f) For the transport of passengers	432,000
g) For the Prince Friedrich-Leopold Canal	650,000
Total. . .	8,815,000

Our journey was then stopped for a few moments in order to visit a home for the children of sailors at Teltow. This institution, founded by a Committee under the presidency of Madam von Budde, wife of the Minister of State, allows the children of sailors to be maintained and educated during several years, when this is not possible by the parents owing to their frequent changes of residence. We were informed by superior counsellor Sympher that the sum of 180,000 marks had been collected for this object. The house actually built is only a first instalment of the project. It is at present occupied by about 40 boys and girls.

After we had re-embarked on the steamer we crossed the delightful and picturesque Machnow lake which is surrounded by murmuring forests, and from there we passed through the only lock that the Teltow canal possesses, which enables the boats to go up and down and negotiate an average fall of 2.74 m. (See Figs. 3 & 4.)

This is a double lock composed of two parallel lock chambers which are separated by a platform 12 meters wide, and so connected together that each one acts as a reservoir towards the other. In this way, with regular traffic, half the consumption of water can be saved, on condition, of course, that there is always one boat in one lock chamber going up stream at the same time as a boat in the other lock chamber going down stream. This can generally be attained as, the district having undertaken to carry out the haulage itself, arrangements have been made for signalling the arrival and departure of boats at the lock with great exactitude. But even if there is only one boat going through the lock the adoption of two lock chambers still saves a third of the water.

The lock chambers have a available length of 67 meters and a width of 10 meters. These chambers communicate with the waters of the upper and lower reaches of the canal by means of culverts 2.46 m. in section, which are provided on each side of the lock chamber, and which have each 9 openings on each side 0.72 m. section, so that the water which enters the lock chamber is distributed equally throughout its length and raises the boats uniformly. The two lock chambers are connected by a transverse aqueduct at the upper end which is itself connected to the lateral culvert. The water is drawn from the culverts by means of Hotopp syphons which have already been used on the

Elbe-Trave canal. Each lock chamber has four of these syphons two at the upper end and two at the lower end. The two lock chambers are connected and disconnected with a view to being filled alternately by means of a lever which is arranged on the upper part of the dividing wall.

The lock chambers are closed at each end by iron gates which are raised and lowered vertically. Each gate is counterweighted so that, when immersed, there is an overweight of about one ton, and the lower part is closed notwithstanding a thrust at



Fig. 3. — Lock near Klein-Machnow
View from the downstream end.

the top of about 2 tons. The motor — a motor with a revolving field of 10 HP. (intermittent 15) — is able at the commencement of the operation to raise the overweight of one ton and subsequently to raise to the prescribed height of 8.27 m. 3 tons in a total maximum time of 60 seconds, and at the same time to overcome the resistance of friction and wind pressure and a water pressure of about 0.10 m.

Instead of the capstans formerly used for the traction of boats in locks, trucks are used to run along the side walls at the top

of the lock, right up to the end of the wall, on tracks which are set back 2 meters from the line of the chamber wall, and are 2.5 m. above the foot-bridge.

In connection with the plant of the lock there is a hole in the dividing wall for the overflow of the high waters with a pipe which is closed by an ordinary friction sluice valve. This valve is raised by a motor with revolving field of 8 HP, of 580 revolutions with 220 volts.

After having witnessed the passage of a freight barge through

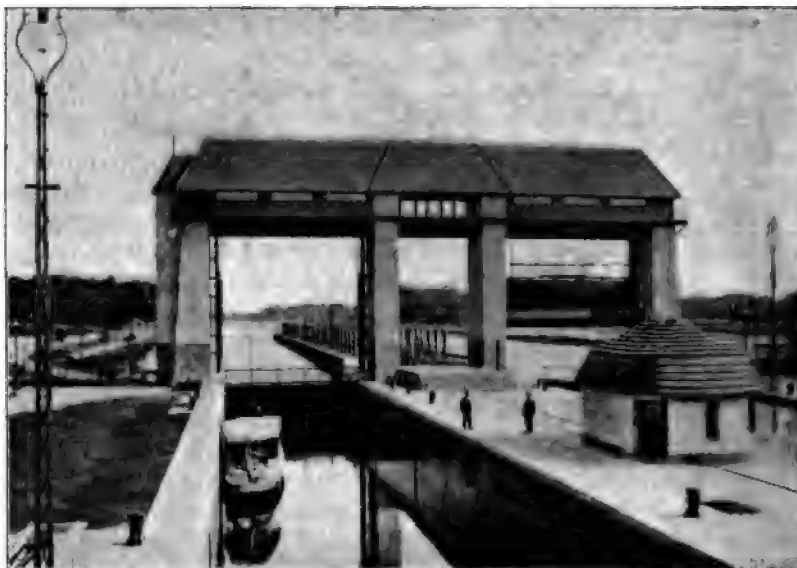


Fig. 4. — Lock near Klein-Machnow
View taken from the up-stream end.

the lock which happened to be there. we directed our steps to the inn of the lock, which was well appointed, and entered a decorated room on the first floor, where we took a lunch offered to us by the district of Teltow.

The secretary of the German Delegation, Mr. BARON VON COELS VON DER BRUGGHEN, Under Secretary of State at the Ministry of Public Works in Prussia, then made the following speech : —

Ladies and Gentlemen,

The response given to our invitation to journey along the Teltow Canal by the large number of those who have taken part in the International Navigation Congress on their way through Berlin, has given us great satisfaction ; they have been able to see not only its technical installation but also enchanting sights. I welcome you from the bottom of my heart here in this magnificent building which, like the canal, testifies to the enterprising spirit of the municipal authorities of the Teltow district.

We congratulate ourselves on having been able during this journey to make the acquaintance of engineers from different countries ; and we trust that the XIth. International Navigation Congress at St. Petersburg, to which we are going with great hopes, will contribute further in uniting the engineers of various countries in the bond of common work. Technical work is not limited by geographical considerations ; it is international in character. We have all been animated with the same desire of learning something new in a foreign country, and of making known the results we have obtained, and thus contributing to the welfare of all peoples. With every good wish of meeting again our dear guests and their ladies who are assembled here to-day at the St. Petersburg Congress, I ask for three cheers : Hoch ! Hoch ! Hoch ! (*Applause.*)

Mr. DUFOURNY of Brussels, General Secretary of the Permanent International Association of Navigation Congresses, then speaks : —

Ladies,

Mr. President,

Gentlemen and dear Colleagues,

The Presidents of our Association are detained at Brussels up till the last moment by their work. They have been deprived of the pleasure of stopping off at Berlin and being amongst us to-day. They have asked me to express their regrets to you.

In their absence it is to your General Secretary that the honour falls, and it is also a very heavy task of speaking on behalf of the whole Association and of thanking Baron von Coels von der Brügghen for the amiable and warm words of welcome which he has addressed to us, of thanking the Teltow Canal Company and its eminent manager Mr. Sievers for their beautiful reception, and, lastly, of thanking generally our comrades and friends of Berlin for the cordial and friendly welcome which they have given us.

On arriving at Berlin we found everything perfectly organised. Thanks to the attention and forethought of our dear colleagues our hotels and our rooms were booked ; our excursions all prepared. The sun, which has been sulking for many months, now floods us with its most cheerful rays, and the locomotive which is going to take us tomorrow to the extreme east of Europe, to St. Petersburg to the Sessions of the XIth. International Navigation Congress, is all ready at white heat.

This is the third time within a few years that our Association is assembled on German territory.

You still remember the unforgettable Congresses at Frankfurt-on-the-Main and at Düsseldorf, which have left such a glorious and luminous track in the history of the progress of Navigation.

Everywhere from north to south of Germany, in towns, yards, works, ports, seaports, we have been received with open arms, and we have collected information of the highest technical value. Everywhere we have found an enterprising, active and enlightened people going ahead, accomplishing remarkable work in all spheres of navigation.

Germany is to-day at the head of our Association in the number of its members, in its grants-in-aid, in its assistance, and in its enormous and learned scientific work. She has a robust and unshakeable faith in navigation ; more than this, she has the faith and the work. One of the most striking and eloquent proofs of this is the Teltow Canal, which we have just traversed together. The Teltow Canal is an admirable work which combines all the progress of modern science and does the greatest honour to our German colleagues who conceived and built it, and to the directors of the Teltow Canal and its eminent manager who work it in such a brilliant manner.

I should consider myself lacking in duty, gentlemen, if at this moment, at the very doors of Berlin, I did not recall to you the

beautiful and noble motto of our Association « Navigare necesse » which we have copied from His Majesty William II, the august Sovereign who presides over the destinies of Germany. (*Prolongued applause.*)

For this reason, gentlemen, I am certain I interpret the wish of all, and am the faithful transmitter of your sentiments, in proposing three cheers :

For the Emperor of Germany, William II, high and illustrious protector of navigation ;

For the management of the Teltow Canal which has received us so beautifully and given us the benefit of these excursions ;

For our dear and honoured colleagues of Berlin who are entitled to our esteem and gratitude for the services they have rendered us.

Hoch ! Hoch ! Hoch ! (*Prolongued applause.*)

After the speech of General Secretary Dufourny, General Reund Baurat SIEVERS, manager of the Teltow Canal, then spoke : —

Ladies and Gentlemen,

In the first place allow me to thank the speakers who have preceded me, and especially the General Secretary Mr. Dufourny, for the amiable words they have uttered on the subject of the « Kreis » and the management of the Canal.

The works and plant you have seen here has been carried out with a view to future requirements, to cope with the traffic which it is estimated will be increased in future.

After the speech of General Secretary Dufourny, Regierungs-somewhat monotonous, we shall have the opportunity of passing through the next section of the canal in the midst of most attractive landscape which can be admired by the ladies if the weather keeps fine.

I raise my glass and wish you a pleasant journey.

Mr. CHARGUÉRAUD, of Paris, then rose and spoke as follows :

Gentlemen,

I am speaking to the gentlemen but I hasten to say that the tractive scenery which can be admired by the ladies if the will do so.

Gentlemen,

We men are somewhat personal in our views and have the habit of priding ourselves exclusively on all the success which we encounter. Without wishing to diminish in any way the praise due to our eminent colleagues, you must allow me to say that the ladies have certainly had a happy influence on the organisation of our Congresses, and I am certain that they have contributed to their ever increasing success.

I am not only speaking of the charm which their presence adds to the excursions in which they have participated. We have seen some extremely interesting things to-day : we have appreciated the lunch which has been so admirably offered to us at this lock which is marvellously provided with all modern luxuries both as regards shipping and men. You will, however, agree with me that all this would largely lose its attraction if we had not the pleasure of seeing at these tables the numerous ladies who have not hesitated to accompany us in this exclusively technical trip.

I thank them most sincerely and especially for their influence upon our Congresses, and, in expressing myself in this wise, I have in mind one of these ladies, my neighbour on my right, who is entitled to her share of the praise which we offer so heartily to our General Secretary.

Would Mr. Dufourny alone have had the strength and the perseverance which are indispensable to the work which he has undertaken had he not felt himself always supported by a companion who is herself one of the faithful members of our Congresses? At difficult moments she gave him the necessary courage to leave her in order to do his work. She is entitled to our respectful gratitude.

Gentlemen, I ask you to drink the healths of the ladies, and especially that of Mrs. Dufourny.

After lunch we re-embark in the steamers and we now cross the section of the canal where the most beautiful sights are to be seen. We pass in front of Neu-Babelsberg, Potsdam, Sakrow, the island of Peacocks, up to Wannsee.

Tea and coffee served to us en route. Unfortunately a little rain is beginning to fall, so that the great charm of this beautiful country with its wooded banks does not appear to us in all its beauty. The steamer arrived at the landing stage at Wannsee at 4 o'clock in the afternoon. Most of the excursionists returned to Berlin by the Wannsee railway. Here, however, a friendly meeting took place at the Rheingold Restaurant, Potsdam Place.

Next morning, Friday, 29th. May, at 9.30, those members of the Congress who had registered to take the special train organised by the German delegation, met at the Zoological Gardens and Friedrichstrasse Station respectively on the Metropolitan railway. The 165 delegates were immediately settled into 5 corridor carriages and a luncheon car. The journey was effected in most beautiful weather via Cüstrin, Schneidemühl, Dirschau, Marienburg, Königsberg, Eydtkuhnen. We reached the Russian frontier at about 10 in the evening. The train stopped at Wirballen where our luggage and passports were examined and we changed carriages. The first special train of 5 sleeping cars left the station at 11 p. m. The second special train, made up of carriages belonging to the Imperial Family, left an hour later. The first train arrived at 4.30 p. m. and the second at 7.30 p. m. at St. Petersburg, after a long journey through Russian country of a very uniform aspect, and were received at the terminus by the members of the Lodgings Committee where we found a large number of hotel carriages awaiting us.

Presidential dinner of the XIth. International Navigation Congress.

THE RECEPTION AT THE CONSERVATOIRE.

On Sunday evening 18/31 May, the eve of the opening ceremony, the General Presidency of the Congress gave a friendly dinner in the rooms of the « Bear » restaurant at St. Petersburg, the guests consisting of the members of the Permanent Commission of Navigation Congresses and their collaborators.

There were 120 covers. Extreme cordiality. During the whole of the repast the tzigane orchestra played the most celebrated national airs of the various nations represented.

When it came to the toasts, Mr. V. DE TIMONOFF pronounced a speech of welcome on behalf of the Organising Commission of the XIth. Congress.

Gentlemen,

On the eve of the opening of the XIth. International Navigation Congress we must address our respectful gratitude to the one who has ensured the success and brilliancy of this Congress by having consented to take it under his high patronage. I beg you, gentlemen, in accordance with the noble traditions of all nations, to drink the health of His Majesty the Emperor of Russia, High Protector of the XIth. International Navigation Congress.

An International Congress like ours is the common work of all those countries which have taken part in the formation and maintenance of our Association, and I beg you, therefore, to drink the healths of the Sovereigns and Chiefs of all the States which are represented at the XIth. Navigation Congress.

The Grand Duke Michael Alexandrovitch has consented to act as first Honorary President of our Congress. I ask you to drink the health of his Imperial Highness.

I am convinced that you will join me in the toast to the Honorary Presidents of our Congress who are the Ministers of Interior, of Finance, of Ways of Communication, of Marine, of Commerce and Industry and Agriculture, and of the Mayor of St. Petersburg, and also to the toast in honour of the Presidents on the Patronage Committee.

Two of these have given us the pleasure of their company tonight, Under Secretary of State, Miassoiedoff Ivanoff and the present Privy Counsellor Saloff.

And now, gentlemen, will you allow me to say a few words on the subject of the Association itself. It was formed in Brussels in 1898, and is therefore not more than 10 years old. Although still in its youth, it has already acquired exceptional international power, and justifies the word of the poet : « Aux âmes bien nées, la valeur n'attend pas le nombre des années. » It has attracted the sympathies of many countries in a form

which leaves no doubt of the sincerity of sentiment, namely the form of important subsidies. It has known how to speak authoritatively in many instances. It is no doubt on the point of doing far more through one of its important features — its effect on international social amenities.

Only a few centuries ago Europe was still divided into a myriad of small states waging apparently endless war upon each another. In these few centuries these small states have been consolidated into powerful states, and the tendency to war has been greatly reduced. The general impression we may gain from this lesson in history is that humanity is marching, perhaps somewhat unsteadily, but certainly decidedly at times, towards a period of international equity.

And are not Associations like our own called upon to play an important role in this march of events, and in fact, do they not already play this role?

Whilst it is working with great deal and remarkable success in the resolution of navigation questions, the International Association of Navigation Congresses is also working with a success, which is no less great, towards the era of universal peace.

Gentlemen, I conclude by wishing long life and prosperity to the Association of International Navigation Congresses, and I ask you to drink the healths of all its members and especially of those who agreed to attend personally the XIth. Navigation Congress.

I echo the sentiments of all in proposing a cordial and warm vote of thanks to the eminent and devoted General Secretary of the Permanent Association, Mr. Dufourny. (*Prolongued applause.*)

Mr. DUFOURNY replied on behalf of the Permanent Association by warmly praising the organisation of the XIth. Congress carried out by Mr. de Timonoff, this praise being confirmed by unanimous applause.

Gentlemen,

Some moments ago I agreed with the International Commission of Navigation Congresses to reply very briefly to the beautiful speech we have just heard.

My task is easier as our President has already rendered homage to all the authorities who have so largely contributed towards the organisation of this Congress.

He has left no one out and there are no gaps to be filled.

It is a sacred tradition, and one in which we have never failed, that the General Secretary of the Permanent International Association of Navigation Congresses should thank his colleague, the General Secretary of the Local Commission, for the victory he has just carried off after the great battle of organising a Congress.

Your General Secretary fulfils this duty to-day with all the more pleasure and happiness that Mr. de Timonoff is a friend whose affection dates back, alas! — because this shows how old we are both getting — for nearly 25 years.

But what am I saying! Why call Mr. de Timonoff my friend when he is the friend of all of you without exception, and when not one of you has been able to resist the charm of his character, of his extreme amiability, of his great worth, of his scientific standing. Although he is the representative of one of the largest countries in the world, he is modesty itself, obligingness incarnate, and perpetually willing to help. We have witnessed with what fire, with what ardour, with what power, he has collaborated to the greatness of our Association from its origin. (*Applause.*)

Without Mr. de Timonoff we should not be here to-day. He is the hero of this function, and I am sure that you will cry with enthusiasm in all languages the hurrahs, hochs, and bravos which will acclaim our dear, honoured, and distinguished President and General Secretary Mr. de Timonoff, and with him all the members of the Executive of the Presidency. *Repeated applause.*)

After coffee the guests separated and met again at a reception at 9 p. m. at the Conservatoire which was a very brilliant and successful affair.

All the exhibits of the Congress were arranged around. Those responsible for the decoration had decorated the various rooms and galleries with excellent taste, with banners and flags of the various nations represented.

Mr. de Timonoff, General President, surrounded by the mem-

bers of the Organising Commission, receive the members of the Congress and the guests at the top of the main staircase.

Sprays of flowers were offered to the ladies who had come in large numbers, whilst an orchestra played some pieces which had been composed with great care.

A magnificent buffet was installed upstairs and a large hall was made ready for a vocal and instrumental concert to be followed by a dance.

At 10 o'clock Mr. DE TIMONOFF requested silence for a few moments in order to pronounce the following short speech : —

Ladies, Gentlemen,

If I take the platform to-night it is not with the intention of wearying you with a long speech.

Speeches of this kind are, according to the wise traditions of our Association, reserved for the inaugural ceremony which will only take place to-morrow.

This evening will be devoted to chatting between friends who have met again after many years of absence, and to the exchange of impressions which invariably precede all Congresses, so that the fusion of intelligences may be prepared in advance, and the shock of the ideas from which truth shall spring shall be softened as much as possible. If I take the platform to-night it is to tell you all : —

Be welcome to our country.

A superb concert was then given and the guests took advantage of the refreshments in the buffets in the various halls. Then a ball was opened which was prolonged in a very gay and animated manner far into the night.

Reception at the Hotel de Ville of Saint Petersburg

On the evening of the official inaugural ceremony, Monday 19 May/1st. June, the Congress was received at the *Duma*, the Hotel de Ville, by the Municipality of St. Petersburg. The crowd was considerable and the sight a magnificent one.

Buffets, decorated with flowers, were installed along three sides of the rectangle which constitutes the large hall for fêtes.

At the end of the hall a band played various pieces of Russian music, the *Entr'acte of Carmen*, the *Faunes* and the *Souvenir de Vienne* of Andreef, and the *Cœur Brisé* of Gillet.

The Mayor of St. Petersburg being ill, his Assistant took his place upon a temporary platform, and drank the health of the Emperor and welcomed the members of the Congress.

Mr. DE TIMONOFF, President of the Congress, replied as follows : —

*Mr. Assistant Mayor,
Ladies, Gentlemen,*

The great Emperor who looks down on you from this portrait, founded his capital on a site where he found the point of junction of maritime navigation with the inland navigation of an entire continent.

The experience of two centuries has proved the correctness of this happy choice, and the capital of Russia has become one of the capitals of universal navigation.

Consequently the organisers of the International Congress of St. Petersburg have not hesitated to ask the Mayor of the city of St. Petersburg to share the Honorary Presidency of the Congress with the Ministers of His Majesty the Emperor.

The Mayor and Municipal Counsellors of the City who offer us to-day such a cordial hospitality are also intimately connected with the work of the XIth. International Navigation Congress, and the Members of the Congress, proud of this union, formulate the most hearty wishes for the prosperity of the City of St. Petersburg — a prosperity which can only be attained and maintained by the unceasing development of what is nearest to our hearts, navigation.

The motto recently adopted by the City of St. Petersburg for its scheme of bridges on the Neva prove this very well. This motto is « *Free Navigation* ».

We therefore beg the Assistant Mayor to express our regrets to His Excellency the Mayor of St. Petersburg that his illness has deprived us of the pleasure and the honour of seeing him amongst us, and, at the same time, we address to the Municipal Council the expression of our certainty of the great future of

this city of St. Petersburg which will accrue to it jointly through the sea and Lake Ladoga.

Long live St. Petersburg ; long live the Assistant Mayor ; long live the Mayor ; long live the Honorary President of the XIth. Navigation Congress.

Mr. VAN DER LINDEN then thanked the Assistant Mayor in the following terms : —

I wish, said he, on behalf of the Belgian Delegates, to address you the expression of our gratitude for the influential patronage you have been good enough to accord to the XIth. Navigation Congress. Thanks to this enlightened protection the work of the Congress, already so prolific, will have made a further decisive progress at St. Petersburg. But allow me, Mr. Assistant Mayor, to say to you, without delay, how grateful we are for your intelligent co-operation, and to ask you to bear in mind that this gratitude is of a peculiar kind emanating, as it does, from a Belgian delegate.

You know the tenderness that a mother has for her child and how she loves all those who wish it well. This is practically our own case for Belgium is, in a sense, the mother of Navigation Congresses (*applause*). She presided at the birth of the Navigation Congress and guided its first steps, and she, with others, has sustained it at critical moments.

The child has grown up now. In 1885 there were only a few members, of conviction it is true, but now, since the formation of the Permanent Association, we number 34 States who patronise the work of the Congresses many corporate bodies, and 1,600 members.

To what must we attribute this rapid growth ? In reality to the perseverance of the promoters of the Navigation Congresses ; to the unceasing and increasing encouragement of the States, and especially to the sustained efforts of the members of the various countries which is manifested by their work for the propaganda and brilliancy of the Congresses.

The Municipal Council of St. Petersburg has also brought us to-night its high and precious collaboration. Let us thank it by our cheers ; and may it accept our sincere wishes that the prosperity of Russian navigation shall be its recompense for the interest it has shown in its development.

Messrs. ESCALAS, of Barcelona, and MAGANZINI, on behalf of his Italian compatriots, then spoke a few words of thanks.

This brilliant reception concluded at midnight.

To the Ports of St. Petersburg and Cronstadt

236 members of the Congress embarked on Tuesday 22 May/2 June on the board the steamers *Kotline* in order to visit the ports of St. Petersburg and Cronstadt. The General President of the Congress, Mr. de Timonoff, saw personally to the preparations for the excursion which he was unable to attend owing to his being otherwise occupied with the work of the Congress.

When the signal for departure was given at 10.20 a. m., the sky was overcast and there was a fairly strong north-east wind.

The temperature gradually became more agreeable and the day became magnificent. The customs Band played on board during the whole of the journey.

The customs quay, now being built on the left bank of the Neva, was first visited. The members of the Congress disembarked in order to examine these works more closely, and they walked along the southern side of the Goutouefski basin and the stone quay of the maritime canal right up to the southern extremity of this quay.

At that point four tugs belonging to the Works Department awaited the excursionists and took them successively to the Khlennaïa-Lesnaïa basin, to the timber yards, and to the works for raising the level of Volny island by dredging deposits.

The members of the Congress were much impressed by the importance of the quays which were loaded up with goods, and of the basins which were full of craft. One might imagine that for many it was a revelation of a hitherto unsuspected activity. The contrast is, in fact, very striking between the Russian railway stations, where the commercial activity is so slight, and these ports of the Neva which have become inadequate for the enormous traffic, and which it will be necessary to increase and to extend in a down-stream direction.

Let us return to the *Kotline*. At 12.30 the members of the Congress were gladdened by an exquisite lunch, the food and

the Russian drinks being highly appreciated during a superb promenade in calm waters.

We arrived at Cronstadt at 2.30. A large number of officers of the Imperial Navy were assembled on a temporary landing wharf and received the excursionists with great courtesy.

The members of the Congress were in the first place conducted to a large shed where the torpedo vessels are stored. One of these vessels was launched very ably and very rapidly



Fig. 5. — Visit at Cronstadt (Slips for a torpedo boat).

to show the facilities that the arsenal of Cronstadt possesses for launching these vessels.

The various buildings of the Imperial Navy were then visited in succession under the guidance of Rear Admiral Bergstroesser, commander of the Port, his assistant, Rear Admiral Kniaseff, and colonel Berg, Chief Engineer, and his assistant engineer Schavernvosky.

The visitors then inspected the building sheds, the Constantinovsky and Alexandrovsky dry docks, the Voennaia basin and the Petrovsky dry dock.

At 6 o'clock, the members of the Congress were received at the Club of the Imperial Navy where a splendid repast was spread before them with admirable decorations in the large reception hall. Verdure, flowers and no ceremony. A general cordiality. Exquisite cheer. Abundant and choice wines.

The band of the fleet gave a magnificent concert during the whole time of the meal.

When the time came for giving the toasts the Maritime Prefer, Vice-Admiral NIKONOFF, who presided, proposed the health of His Majesty the Emperor and the Imperial Family in warm terms which was received with acclamation.

The band played the national hymn, and Vice Admiral NIKONOFF, rising again, gave utterance to the following brief word of welcome : —

In welcoming you, ladies and gentlemen, said he, I not only speak on my own behalf and on that of the officers of the Russian Navy who are present here to night, but I also speak on behalf of all their comrades whom the exigency of the service compel to remain on board or who have had to go away from the Port of Cronstadt.

I do not know whether this excursion has been agreeable to you. I fear that it may have been a tiring one, but I trust it has been an instructive one.

In any case we have done all we could so that you should take away the best recollections of our hospitality.

I raise my glass and drink to your healths and to the good success of your work with all my heart. (*Great applause.*)

Mr. DE SCHOKALSKY, Major-General of the Navy, President of the second Section of the Congress, gave the following toast :

*Excellencies,
Ladies and Gentlemen,*

Every affair, whether it is an important one or an insignificant one, requires for its satisfactory accomplishment, not only the sinews of war, but also zeal, perseverance, and especially the knowledge of how to do things.

As a member of the Local Organising Commission, and on its behalf, I speak to-night amongst all our maritime colleagues

in order to thank the Minister of Marine, the General aide-de-camp of His Majesty the Emperor, Admiral Dikoff, for all the care he has been good enough to take regarding the members of the Congress; Vice Admiral Nikonoff, Maritime Prefect of Cronstadt, all his assistants, and particularly, Vice Admiral Kniasef, Chief of the Staff, Vice Admiral Bergstroesser, Commander of the Naval Port, and the officers who conducted the excursionists through the Port. Not only were they able to make all necessary arrangements in anticipation with great foresight, but they have also arranged for splendid weather outside and a good and cordial atmosphere inside. Hurrah!

Vice Admiral BERGSTROESSER then aroused enthusiasm by saying in German how happy he and his comrades were to receive the members of the Congress. Hospitable traditions are a point of honour with the Russian nation.

And its marine, wherever it may be found, endeavours to maintain the best relations with the sailors of other nations. He concluded by drinking the healths of the members of the Congress.

Major General DRIGENKO then gave the following toast in the name of Mr. de Timonoff : —

Ladies, Gentlemen,

Mr. E.-V. de Timonoff, the President of the Organising Commission of the XIth. International Congress, has asked me to take his place and express on his behalf his regret, notwithstanding his sincere desire, at not having been able to take part in this outing.

He had to give it up as the affairs of the Congress only allowed him the time to accompany the excursionists up to the landing stage.

Mr. de Timonoff, certain of the amiability and traditional hospitality of Russians and of the sailors of Cronstadt, has asked me to express to our amiable hosts, the Navy Club, — and for my part I associate myself with all my heart with this sentiment — his profound gratitude and his desire for their success, and has asked me to drink to the health of the sailors of Cronstadt. Hurrah!

Mr. ZOLTAN KOHANYI, chief engineer in the Hungarian Navy, had been selected to reply to the speeches of welcome on behalf of the official delegations of the various states represented. He expressed himself in the following terms : —

Ladies, Gentlemen,

You will, I know, excuse me if I am unable to address you in Russian. To my great regret I am unable to speak in the language of the country which is receiving us to-day so hospitably.

On the other hand, I cannot use my native tongue — Hungarian — without risking to be understood by only two or three members of the Congress. I will, therefore, ask you to be good enough to allow me to speak in German, which is spoken by most of the members present.

At this moment I congratulate myself on being a sailor now that we are in the buildings of the Navy Club. As a naval officer, it has been my business to travel throughout the world during eighteen years.

I remember that in all the foreign ports we have received the warmest welcome and their inhabitants have always done all they could to render our sojourn as agreeable as possible.

The reception which was accorded to us at St. Petersburg was a brilliant one. It is exceeded by the welcome which has been reserved for us at Cronstadt, and, to the hospitality which is universally recognised as one of the characteristic features of the Russian people, we find joined the traditional hospitality of the Navy.

Allow me, ladies and gentlemen, to be the interpreter, not only of my compatriots, but also of all the members of the Congress here present, of our gratitude to the Navy for its cordial welcome ; and I beg to propose a « Hoch ! » for the prosperity and the powerful development of the Russian Navy.

These were the only official toasts. A few brief words were then uttered in succession, by Mr. L. STEINER, who gave expression to the sentiment of gratitude of his Austrian compatriots, Mr. PAOLO MARZOLO, Director of the Hydrographic Institution of Genoa, Rear Admiral CHESTER, and, in conclusion,

a witty toast on behalf of the ladies, was proposed by Mr. VANDERLINDEN. All the speakers were warmly applauded.

It was necessary to think of returning. The members embarked upon the *Kotline* in the midst of « Hurrahs ! » and to the sounds of a last piece played by the band of the fleet, whilst a magnificent sunset, which called forth general admiration, added lustre to a beautiful day which had been concluded all too soon.

On the Ladoga Canals and on Lake Ladoga

This excursion took place simultaneously with that of Cronstadt on Tuesday, May 20th./June 2nd.

The members of the Congress embarked at 8 a. m. on board *Pospiéchny*, a screw steamer belonging to the Schlussembourg Navigation Company. Mr. de Timonoff, General President of the Congress, was present at the departure and directed personally the preparations for this excursion which he was unable to attend owing to his time being taken up by the other work of the Congress.

The first stop was at the Nevsky Works, which were visited by the excursionists. The latter were received by the superior executive staff and by Mr. A. de Dreyer, managing director. Mr. N. Kalabin, Works Manager, Mr. E. de Groté, chief naval engineer, Mr. P. Staritzky, chief mechanical engineer, Mr. D. Wourgaft, head of the metallurgical department, Mr. A. Anchitz, head of the locomotive department, and by several engineers of the works who had been placed at the disposal of the members of the Congress. The latter made a special visit to the naval yards where two steel hulls for ice-breakers for a Polar exploration are in course of construction : they then visited the foundries, electrical central generating and pneumatic station, where the pumps are used to supply the works with water. These vast works were visited by means of two small trains hauled by locomotives.

A lunch was served in the drawing office of the works before the visit was commenced. Before leaving the excursionists were again invited to partake in a stirrup cup.

It is half past eleven when they re-embark, this time on board two steamers : the *Pospiéchny* and a larger paddle steamer, the

Apostol Pavel belonging to the Onega Navigation Company. Other important works were soon passed above the Nevsky Works, such as the Alexander Works, which make the rolling stock for the Moscow lines, and also the Imperial Glass Works, the foundries for the naval guns, spinning works and paper works. The left bank of the river is more specially devoted to industrial establishments, no doubt on account of the proximity of the railway.

We passed frequently on the Neva trains of barges loaded especially with timber. The barges used for this kind of traffic are generally in batches of four which enables them to be more easily handled and to go up stream. Of course the barges, even when empty, are hauled in single file, in order not to increase the resistance of the stream.

The latter is of great strength at certain narrow points along the river and one finds veritable rapids at Cape Sviatki, where the width is only 213 meters, whereas this width exceeds 1,200 meters at the village of Ivanovsky which is only 1 kilometer below that point. The mean width of the Neva is 533 meters. The river has several sharp bends which, together with the variation in the width and depth of bed, cause deposits to form when the ice comes down from Lake Ladoga. The banks, which are exposed to the action of the current, are very much eroded in certain parts.

At 12.25 the two steamers passed abreast before the mouth of the Ijora. Lunch is commenced on board both steamers. At 1 o'clock the mouth of the Tosna is passed at a very wide portion of the river; they then passed through the rapids of Ivanovsky.

The *Pospiéchny* had slowed up before reaching the rapids as the channel is too restricted to allow of two steamers navigating abreast. It then increases its speed and passes the *Apostol Pavel* which it soon leaves far astern.

Lunch is finished; the sky, hitherto covered, becomes clearer; the sun contributes its joyous note to the landscape. We pass a wooded region with dunes of increasing height. These attain to 40 meters in height just below Schlüsselbourg where they form the Préobrajensky hills.

At 2.30 we arrive at Schlüsselbourg where a rustic triumphal arch is erected with the words « Welcome. Soyez les bien-venus. Willkommen » where a sympathetic crowd is collected on the quays. The excursionists leave the steamers and divide again

into two groups. The more important group, which consists of nearly 200 members, first takes a walk along the Emperor Peter the Great and Emperor Alexander II canals. It then re-embarks on the *Apostol Pavel* and makes a fairly long excursion on Lake Ladoga.

The Emperor Peter the Great canal is the oldest of the six canals which are built on the south side of Lake Ladoga and which were constructed for the purpose of protecting inland



Fig. 6. -- The Schlüsselburglocks.

navigation craft from the hurricanes which are encountered on the lake itself. This canal, commenced in 1719, and concluded in 1731, was first called the Ladoga canal, and subsequently took the name of its illustrious founder. It is 111 kilometers long and has a pair of locks at each end. The available length of the lock is 55 meters and the width 8 1/2 meters and there are six locks at Schlüsselbourg and five at Ladoga.

The new Alexander II canal, which runs parallel to the first one, and is still nearer to the lake, was opened to traffic in 1866. It has no locks and the depth depends upon the level of the lake waters. Its width at the bottom is 25.6 meters, and at the water line it is 38 meters wide in ordinary times.

RECEPTION HELD BY THE MINISTER OF WAYS OF COMMUNICATION.



1. Mr. Schaffhausen-Schönberg-Eck-Schäufuss. — 2. Mrs. Schaffhausen-Schönberg-Eck-Schäufuss.
3. Mr. V. E. de Timonoff, General President of the Congress.

The smaller group of excursionists (about 60) embarks on two small State steamers which go up the Alexander II canal, as far as verst 14. The members of the Congress notice the variations in the cross sections of the canal and the means adopted to protect the banks. There is rubble work at the base, fascine work, sheet piling, driven piles with longitudinal beams, fascine mattresses on the slope, cross sections with a berm, and cemented stonework. The banks are protected, especially on the left bank, where the haulage by horses is carried out. As a rule, the right bank on the lake side is not protected and the rubble work is disturbed throughout. The clayey nature of the soil up to about water level happily restricts the effects of erosion which, however, have become considerably more marked since steam tugs have superseded horse haulage.

At verst 14 the excursionists who have landed follow the road which leads through the woods to the great Bougrovsky lighthouse on lake Ladoga. They contemplate, for a moment, the immense expanse of water, deep blue, with white horses, and then they take tea at the base of the lighthouse which is at a very high elevation, and some of the excursionists mount the interminable spiral staircase in order to admire the distant horizon.

They return to Schlüsselbourg and embark on the two large steamers upon which dinner is served whilst they go down the Neva and they reach St. Petersburg about 10 o'clock.

Reception at the Ministry of Ways of Communication

The Minister of Ways of Communication and Mrs. Schaffhausen-Schönberg-Eck-Schaufuss gave a Garden Party from 4 to 7 on Wednesday afternoon the May 21st./June 3rd. in honour of the members of the Congress.

H. I. H. the Grand Duke Michael Alexandrovitch was present after having visited the navigation exhibition in the Conservatoire where all the sections were presented in turn to H. I. H. by Mr. de Timonoff, General President of the Congress. H. I. H. the Grand Duke Michael Alexandrovitch stood for some time upon the terrace which overlooks the gardens of the Ministry of Ways and Communications and asked to have the chiefs of the official delegations of the various States and many members of these delegations presented to him.

Mrs. Schaffhausen-Schönberg-Eck-Schaufuss acted as hostess with extreme graciousness.

Among the crowd of important personages who were presented were : His Excellency the Minister of Justice and Mrs. E. Scheglovitoff, Prince Khilkoff, late Minister of Ways of Communications, Mr. Brandt, Principal, and the professors of the Institute of Ways of Communication, Mrs. & Mr. de Timonoff, Mrs. & Mr. Valouef, Manager of the Northern Railway, Admiral Birileff, former Minister of Marine, and all the members of the official delegations.

The regimental band of the Horse Guards was installed on the lawn and the « *Balalaïka* » of that Regiment was placed under the verandah, both bands giving a ravishing concert of old Russian airs.

A buffet was installed in one of the rooms where toasts were proposed. The Minister of Ways of Communication proposed the health of the Emperor and then that of the members of the Congress. Mr. DE TIMONOFF returned thanks and Professor ANT. SMRECK of the town of Brünn, Moravia, pronounced the following speech in German.

Excellency,

Allow me also to speak on behalf of the numerous persons here present who have come from Bohemia.

During the days we have passed in the country of the great Russian people we have had every opportunity of gauging with admiration the startling progress accomplished in all branches of public work, and especially in the domain of railways and hydraulic works, without mentioning the characteristic Russian architecture, bridge-work, roads, etc. We have, above all, admired in the magnificent capital of St. Petersburg, the artistic buildings which have sprung up recently from the earth as if by enchantment.

We have bound ourselves by ties of friendship to our Russian colleagues and we have learnt to appreciate their high scientific spirit. We have been delighted at the way in which they have devoted themselves to enlighten us on all the subjects which might be of interest to us.

We have, furthermore, encountered the true Slav hospitality which attained its apogee in your Excellency's gracious welcome.

Allow me, I beg you, to propose the health of your Excellency, our admirable amphitryon, and the healths of all those who have worked under your Excellency, for the grandeur and the prosperity of the powerful Russian nation.

The guests then took leave in rotation and the reception concluded at 7 o'clock.

At the Narova Cataracts and at Hungerburg

The excursionists, about 140 in number, left the Baltic Station at St. Petersburg on Thursday morning, 22nd. May/4th. June, at 7.15 by special train. They took advantage of a stop of 20 minutes at the Gatchina station at 8.30 to breakfast. At 11.30 they got out at Narva station where they were received by a delegation of the Town Council. Some carriages and numerous izvotchiks transported them very quickly to the falls of Narova and to the works which are built near the cataracts.

The difference in level of the bed of the river was more than 20 meters on a stretch of 3 kilometers. The bed has been converted into a series of rapids and there are two distinct falls which are separated by the Isle of Kroenholm. The main branch of the river drops vertically, but the left branch drops in three stages. The visitors were greatly struck by the grandiose effect of these impetuous falls. They then investigated the method by which part of these natural forces have been tapped for industrial purposes.

There are three important works at this point, one of which is on the island itself. The Kroenholm works have three branch canals from 25 to 30 meters wide with an average depth of 3 to 5 meters. Eleven Jonval turbines, 450-1,250 HP. each, provide a total energy of 8,445 HP. which is transmitted by suitable gearing. The buildings of these works cover an area of 140,000 square meters. Their plant consists of nearly 462,000 spindles, 128,000 carding spindles and 3,000 looms. There are about 8,300 workpeople who dwell in houses lighted with electricity, which form of illumination is provided in all the outhouses and dependencies, as the works possess an electric generating station. A hospital and pharmacy, a maternity hospital, two schools, a crèche with 40 cradles, some baths and a washhouse, are being erected for the use of the workmen's families.

The two other works for making sheets and for spinning, which

formerly belonged to Baron Stieglitz, have a branch canal in common, 600 meters long, with a minimum width of 8.2 m. and a depth of 1.75 m., which is divided into two sections, one 400 meters long and the other 150 meters long. Turbines with the necessary mechanical transmission are installed and provide 1,000 HP. for the sheet factory and 2,000 HP. for the spinning mill.

The party returned to the town in the carriages which had brought them from the station. The population of Narva gave them a most sympathetic welcome. Flags were hung out in their honour and the Town Hall was beflagged right up to the top of the tower by which it is surmounted. A lunch awaited them in the hall of the Town Hall.

As soon as the members of the Congress had taken their places at the tables, Mr. TATARINE, Mayor of Narva, proposed the health of His Majesty the Emperor of Russia. This toast, which was received with prolonged applause, was accompanied by the Russian national anthem, played by the 89th. Regiment of the line which was installed in an adjoining room. Mr. Tatarine then made the following speech in Russian.

Ladies, Gentlemen,

I am pleased to have the honour of saluting the members of the XIth. International Navigation Congress on behalf of our city with whose glorious history you are acquainted and which covers several centuries. I am convinced that your visit will contribute largely towards the development of industry here, commensurate with the wealth of the natural resources and the fortunate geographical situation of the district. I hope that you will long preserve an excellent remembrance of this excursion and I raise my glass to drink to the health of the President and the Members of the Congress. Hurrah.

Mrs. Eugenie TOLMATCHEFF, née Karpinsky, then spoke as follows in French : —

Ladies, Gentlemen,

Our President, Mr. de Timonoff, has confided to me the flattering and agreeable task of speaking to-day on behalf of the Organising Commission of the Congress and of expressing its



SOME OF THE MEMBERS DELEGATED BY THE CONGRESS WHO WERE RECEIVED BY THE EMPEROR.

1. The Ministry of Ways of Communication. — 2. Mr. V.-E. de Timonoff, General President of the Congress.
 3. Mr. Saloff, President of the Council of Engineers. — 4. Mr. Drigenko, Member of the Organizing Commission of the Congress. — 5. Mr. Mangouby, President of the Exhibition Commission.
 6. Mr. Sympher. — 7. D' Russ.

deep gratitude for the cordial way in which we have been welcomed.

The organisation of a Congress is a very difficult and complicated task. It would have been still more difficult if the provincial towns had not come to our help by forming Local Commissions. The town of Narva was one of the first to respond with enthusiasm to the appeal of the President. It formed a big Commission by which we have the honour and pleasure of being received to-day. I therefore raise my glass and drink to the prosperity of the town of Narva and of its worthy representatives.

This speech was very much applauded. Some more impromptu speeches were than made. Amongst others may be mentioned those by engineer W. STAVROVSKI in French, by Vice-Consul EDWARD SIRICIUS, in English, by the Assistant of the Mayor of Narva, in German, by Mr. SCHEFFLER, editor of the *Narvski Listok* journal, in Russian.

After lunch the members of the Congress visited the Town Hall and the historical curiosities which it contains. They then visited an old house which contains souvenirs of Peter the Great, and they walked about the town. They admired the interior of the Cathedral, the facades of the old houses, the remains of the ancient ramparts, and the picturesque outlines of the citadel of Ivangorod which can be seen on the other side of the river. The sky got more and more covered and the weather finally became quite bad whilst heavy showers compelled the excursionists to seek shelter.

About 2 o'clock they embarked on the steamer and went down the river until they got near its mouth, and shortly after 3 o'clock they disembarked at Hungerburg. They walked about the pretty sandy beach. The weather became clearer and a pale ray of the sun illuminated the sea. The Life Saving Society of Hungerburg then carried out some experiments with life saving cradles and rocket apparatus which greatly interested the spectators.

A well served dinner awaited the members of the Congress at the Casino. The military band which had accompanied them from Narva then took up its quarters in the gallery and cheered the repast with its entrancing strains. The table of honour was

presided over by the Mayor of Narva, as the watering-place of Hungerburg forms part of the territory of that municipality.

When the time came for proposing the toasts Mr. TATARINE gave the healths of His Majesty the Emperor and H. I. H. the Grand Duke Michael Alexandrovitch. He then drank to the health of the President and the Members of the Congress.

Mr. SYETCHNIKOFF, harbour-master of Narva, then briefly described the importance of the traffic of this port. He expressed the hope that, at some future date when a Navigation Congress would again meet at St. Petersburg, the members of this Congress might witness further progress in the commercial activity of the port thanks to the works and visits of the scientific experts of all the maritime countries.

A french member of the Congress then drinks to the economic development of Russia.

Mr. VAN DER LINDEN, chief engineer, directeur des Ponts et Chaussées of Belgium, in his capacity of senior member of the members of the Permanent Commission of Navigation Congress there present, then thanks the ediles of Narva for their beautiful reception. A few more speakers are then heard.

The banquet terminates at 6 o'clock. The excursionists return by boat to Narva where they take the special train which had brought them out in the morning. They arrive at St. Petersburg about midnight, enchanted with their interesting and instructive trip.

Viborg and the Imatra

Although scheduled to start at 7 o'clock the special train for conveying the members of the Congress to Finland on Thursday 4th. June was detained nearly half an hour to oblige some late comers, to the great anxiety of the organisers who considered that the day was already too well filled and that there was no time to spare.

On their side everything had been done in perfect order and with great simplicity and rapidity. Each member's card was checked on the quay and stamped with the number of the

wagon and the seat to be occupied for the journey during the day and for the sleeping berth during the night.

All that was required was to write five figures and to check it on the general list. Each one took his place and could walk up and down the corridors of the 14 sleeping cars in search of friends who had come out to Russia, or of acquaintances which had been made since the opening of the Congress.

But the precautions were quite superfluous as the organisers had grouped the members of the Congress together in nationalities with great tact and care.

Two or three stops en route enabled the members to comfort themselves with tea or coffee at the buffets in view of the bracing morning air. The nature of the hospitality offered by the Finns was already being experienced. A great hospitality of unsurpassed generosity. The buffets were instructed not to accept payment and everyone who offered payment was compelled to put his money back into his pocket.

The sun soon commenced to shine brilliantly and the Finnish scenery, the elegant wooden houses, the graceful birch-trees, the firs, the cork oaks, the mist in the distance, the light and cheerful coloured dresses of the women and children became more and more distinct. When the train stopped, handkerchiefs were waved, and one could see the cheerful glances of blue eyes so limpid and so deep.

At 10.15 the train stopped at Viborg station, have gained 15 minutes on the time lost in the morning. Nevertheless, it was necessary to hurry. For this reason there was no reception on the long wooden elevated quay where the excursionists were awaited by Senator Edv. Hjelt, Chief of the Department of Commerce and Industry, and by the Governors of the Governments of Viborg and of Nöland, the members of the Organising Committee of the Finnish Excursion, headed by Mr. A. Ahonen, district superintendent of the State Railway, Mr. E. Linqvist fulfilling the functions of executive Committee of the Siam, Mr. Perrat, secretary and legal adviser to the Department of Pilotage and Light-houses of Finland.

Salutations were merely exchanged. Proper acquaintance will be made later on, and through a wide avenue flanked on each side by tall houses with magnificent shops on the ground

floor, the party hurries towards the explanade whose trees are still covered with the leaves of a late spring, and they arrive at the *Esplanade Pavilion* where lunch is laid on tables on the terrace and in two wings of the building.

A very simple lunch given by the Town Council of Viborg, but an exquisite one. There was especially a blue trout with sauce Hollandaise, which everyone declared to be unsurpassed in their experience.

Mr. de Timonoff, General President of the Congress, who presided, had Senator Hjelt seated on his right and General von Troil on his left; the other excursionists took their seats in the order they pleased. The band of the town of Viborg played the *Vasa March* and continued to play throughout the whole of the meal.

As the chiefs of the Delegations had to be back at St. Petersburg that night, in view of the Imperial reception on the morrow, it was arranged that the speeches should take place at Viborg and not at the Imatra. They were so numerous that it was necessary, after all, to give up coffee.

Consul EUGENE WOLFF, Member of the Town Council, welcomed the guests in excellent French.

On behalf of the town of Viborg, said he, I welcome you. Thanks to the Navigation Congress we have been able to receive such a large number of people assembled in our city for a few fleeting hours, and, without this happy circumstance of the Congress, they would never have probably found their way here.

We trust you will preserve a good remembrance of this brief excursion.

Mr. Wolff concluded by drinking the healths of the members of the Congress.

Mr. DE TIMONOFF made the following speech : —

Ladies, Gentlemen,

When in 1892 the receptions were organised for the International Railway Congress which was held in that year at St. Petersburg, a brilliant assembly of members of the Congress gathered together in Finland, like to-day, and we then saw the

beauty of this country unrolled before our eyes, and experienced all the cordiality of the charming Finnish hospitality.

I like to evoke these recollections which mark an ineffaceable date in the annals of International Congresses which have been held in Russia. When, at the desire of my colleagues of the Organising Commission of the XIth. International Congress, I was placed at the head of this Commission to undertake the management of the affairs of this Congress, I realised that success could not be assured without the benevolent co-operation of Finland. The Organising Commission thereupon decided to enter into direct relation with the authorities of this country in the first instance by correspondence, and, subsequently, by the intervention of a special envoy, Professor Nerczing, with a view to obtaining the permission to organise an excursion in Finland.

The results of our relations with the authorities of Finland have exceeded all our expectations. Not only was the necessary permission accorded us, but the brilliant excursion to the Siana Canal and to the cataracts of the Imatra, so splendidly organised, have been graciously and absolutely gratuitously offered to us by the Senate of Finland.

The Government of Finland went further than this. It voted considerable funds to participate in the Exhibition Congress; and we have all been able to see and admire the wonderful collection of models, maps and plans which illustrate the development and remarkable progress of navigation in Finland which were exhibited in the Palace of the Conservatoire at St. Petersburg.

But this was not all. The Senate of Finland, anxious to provide you with precise information, technical data, statistics and drawings, has published a work on Navigation for your benefit, whose scientific value rivals its beauty of production, and has presented copies of this work to all the members of the Congress.

It is only fair, therefore, that the most deep felt gratitude should take expression, and I beg that you will repeat with me the words « Long live Finland » with this intention.

FREIHERR VON COELS VON DER BRUGGHEN praised the Finns and Finland « the country of a thousand lakes, the prosperous corner of the great Russian Empire » in the most eloquent terms and his discourse was frequently interrupted by applause.

Mr. SMRCEK, Austrian delegate, then spoke as follows, in German : —

Ladies and Gentlemen,

It is probably for the first time to-day that most of us set foot on the soil of the Grand Duchy of Finland.

We find ourselves in the legendary country of the thousand lakes, a country of foaming cascades which spray their waters upon the rocky steps and blocks of granite. This is a country inhabited by a friendly people, intelligent to the highest degree, active and full of goodwill, who are receiving us to-day.

We realise the trouble, the work, and the perseverance which have been necessary to raise cheerful cities in such a barren country of the north, and to provide it with lines of communication by rail and by road, and also to render the waterways navigable and utilize industrially the water power provided by nature.

Allow me, ladies and gentlemen, on behalf of the Austrian members of the Congress, to wish increasing prosperity to this beautiful country, and to express the hope of a brilliant future for the nation. Allow me again, on your behalf, to drink to the health of the brilliant and courageous corps of engineers of the Grand Duchy of Finland on whom, above all, depends the economic prosperity of the country.

Long live the Finish engineers !

Mr. Ferd. STEPHAN, Counsellor of Commerce at Viborg, then pronounced the following speech : —

Ladies, Gentlemen,

We have the pleasure of seeing among us to-day several members of what we term the fair sex. But this appellation is not sufficient in present times, at all events it is not sufficient in Finland, where the women not only have the vote but where they also compete with men in several branches of human activity.

Our wives are members of the Diet ; they study at the University. We have amongst us women doctors, artists, commercial travellers. Our banks and offices are full of young girls who are employed on the staff, etc. But if you want to know the true Finnish woman you must seek her, here as elsewhere,

in the bosom of the family where she is all-powerful as wife and mother. I sincerely regret, that owing to our not having foreseen your visit, ladies, that there are no ladies here belonging to Finnish society to welcome you. Ladies ! As the fatigue of the journey have not prevented you from taking part in this excursion, the success of which has been enhanced by your presence, I hope from all my heart that you will be able to come again to Finland in order to become acquainted not only with the Land of a Thousand Lakes but also with our women, who will, I am sure, receive you very cordially. Gentlemen, I beg you to drink the health of the ladies present. Hurrah !

Mr. CHARGUÉRAUD, Councillor of State, Director of Ways, Mines and Navigation in the Ministry of Public Works then spoke on behalf of the French members, his speech being full of humour.

He scorned the idea of wishing to make an oration and restricted himself to defining in a very succinct way the place which the XIth. Congress of Navigation will occupy :

The organisers of this Congress, he said, have devised an excellent means to success. It consisted in making the ladies work, a sight never seen before.

Moreover they have found, as the saying is a real catch for their Congress, and that catch is the excursion to Finland.

The municipality of Viborg, on the other hand, have achieved another success by providing this beautiful, sunny spring weather with which we are not familiar, at any rate, not at this time of the year, not even in the south of our country.

Mr. Charguéraud finished, amidst applause, by raising his glass in honour of the members of the Municipal Council of Viborg.

Next Mr. MAGANZINI delivered with some enthusiasm a short speech in Italian, the English translation of which is as follows :

Ladies and Gentlemen,

We are assembled here to celebrate a festival of international friendship in the midst of this splendid region of the Thousand Lakes, in sight of an imposing waterfall, in the green woods ; all of which provide a rich feast for our eyes.

I believe, gentlemen, that the beauty of these enchanted places, where the poetry of the north is mingled to-day with the climate of the south, has only been surpassed by the sumptuousness and the cordiality of the reception which the noble community of Viborg have been kind enough to vouchsafe to us. Be fully assured, you gentlemen representing Viborg, that the sweet and sympathetic memories of this day will ever remain alive and fresh in our hearts.

Thanks to Finnish hospitality and the cares of the organising Committees, we shall be able to visit and admire this beautiful country, which is so little known, but which deserves to be visited and appreciated.

In the name of Italy, ladies and gentlemen, I beg you to drink in honour and to the prosperity of Finland, of the Finnish Senate and the Municipality of Viborg.

Long live the Municipality of Viborg.

A novel feature in the proceedings was next witnessed, when a lady, Mrs. MULLER, member of the Ladies Committee of the St. Petersburg Congress rose and delivered the following speech : —

Gentlemen,

I rise in the name of the ladies of the XIth. International Congress of Navigation in order to voice our very sincere gratitude to the Imperial Senate of Finland for their kind invitation to visit the Saima Canal and the Imatra Falls.

We are only at the beginning of our trip in Finland, this highly cultured country, inhabited by a hard-working and plodding people, where woman has succeeded in securing her place among the people's representatives in the Senate, remaining a good wife and a model mother at the same time.

We have not yet been able to enjoy the glorious sight of the world-wide famous Imatra-Falls, nor to admire the beauties of the Saima Canal.

But we have already felt the vivid impression of nature in Finland and appreciated the hospitable cares of the delegates of the Imperial Senate.

It is to express our thanks to Mr. Ahonen and Mr. Lindqvist for the exceedingly kind and thoughtful reception they have

prepared for us on behalf of the Imperial Senate of Finland, that I raise my glass to the prosperity of Finland, the Finlanders and their representatives.

Eleköön! Suomi! (Long live Finland!)

A final toast, by Mr. WORTMAN, and let us make haste, as we have to depart.

The weather is becoming more and more threatening and coffee will be quite ready on our return.

We embarked on two steamers, which shared between them the excellent music from Viborg, and then started on our visit to the Saima Canal, as far as the first locks.

We passed through the harbour of Viborg amidst loud cheers from every corner. The boat then reached the *fjord* — hedged in by cliffs — which forms the bottom of the Gulf of Finland, where the trees grow right down to the level of the sea, wherein their foliage and verdure are reflected.

The sun had quite disappeared. A slight mist softened the outlines of distant objects and imparted to the landscape a sad look. It was a picture of very delicate tints, mellow like those of a pastel, and, at some distance, the various shades of green of the new foliage seemed themselves to change to grey with the white stems of the birch trees.

Villas were dotted about everywhere, amongst which the name of the *Villa Mon Repos* of Baron de Nicolaï will be remembered, where all species of trees to be found in Finland seemed to grow.

The canal of Saima, amidst such surroundings, thus formed a most picturesque view. The locks looked like decorations, like painted wings on a stage, with the lock-keepers gay and coquettish houses, all covered with foliage and blossoms. The traffic there is very brisk. More than thirty boats, all laden with timber, passed in less than an hour.

We landed at Justila where there is a flight of three locks, which produce a most curious impression. The boats hurry thither and one can see how perfectly they are adjusted.

It is necessary to return to Viborg, where a special train is waiting for the members of the Congress who are obliged to go back to St. Petersburg, while the rest, by far the greater number of those present, get into the train a few minutes afterwards, to go to Imatra.

A few drops of rain had fallen on the return journey to Viborg, but the weather again cleared and on arrival at Imatra, the stroll along the famous falls could be effected with perfect ease. All the members of the Congress were enraptured with the view.

The banquet arranged by the Senate of Finland was held in the *Imatra Falls Hotel*, built at a magnificent site and overlooking the falls, the guests sitting at small tables decorated with exquisite flowers.

The fare was sumptuous as may be judged by the following menu : —

BISQUE D'EGREVISSE, PETITS PATÉS

RASTIGAÏS

TRUITE TAYMINE, POMMES NATURE, SAUCE RICHE

FILET DE BOEUF RÉGENCE

MOUSSE DE FOIE GRAS EN BELLE-VUE, A L'IDÉAL

POUSSINS DE HAMBOURG RÔTIS

SALADE HÉLOÏSE

ASPERGES FRAÎCHES, SAUCES HOLLANDAISE ET POLONAISE

PÊCHE MONTPENSIER

DESSERTS

—

VINS

PORTO ET SHERRY — BERNGASTELET FAVENBERG

CLAU'S JOHANNISBERG — CHATEAU-MARGAUX

CHAMPAGNE « POMMERY »

MOKA, LIQUEURS

The cooking was excellent, and the wines of the best vintages. The assembled company was particularly gay and animated.

The volumes of water tumbling over the precipice roared below. Lighted up by electric searchlights the effect of the foam at the bottom of the falls was most phantastic.

On reaching the stage of toasts, after the Governor of Viborg had drunk the health of H. M. the Tsar and of the Imperial

family, Senator Hjelt in happily chosen words spoke of his country, a land so full of energy and of such sterling value.

This day, ladies and gentlemen, said he, must have fully convinced you that our little native country is not an uncultivated desert.

The wealth of the country is not very great ; on rocky ground, like this, it is difficult to sow and to reap, and the ground here does not hide such great mineral wealth as it does in your own countries.

But what we have in abundance is water, water which facilitates transport, water that constitutes motive power.

For a long time it was our sole means of communication. We have a great liking for this element, and we hope to put it to a profitable use.

I hope that the Congress, where you have studied a portion of the working ways of waters, will bear its fruit for our country.

I have to thank you for the honour you have shown us, and the pleasure you have given us, by coming to see Finland and I raise my glass to your health.

The whole hall resounded with the cheers that followed and were well deserved, because Mr. Hjelt had delivered his speech with some emotion that was truly touching.

As representative of Hungary, Mr. FARAGÓ made the following speech : —

Ladies, Senator and Gentlemen,

Allow me to say a few words on behalf of the Hungarian delegates, the delegates of a nation that is of the same origin as the Finnish nation. Scientific investigations have already proved conclusively that these two nations have branched off, more than a thousand years ago, from the same stem.

Unfortunately, the two languages now differ so much that we are no longer able to understand each other.

In the whole of Europe there are but two nationalities of the Finno-Hungarian race who have maintained themselves by the side of other nations and collaborate with them in all their

work, the purpose of which is the common development of the human race.

Allow me, ladies and gentlemen, to continue my speech in German and to address my remarks personally to our dear president.

The following is an English translation : —

Senator,

Having come to the Congress of St. Petersburg with seventeen of my countrymen, we all felt it our duty to accept the kind invitation from the Imperial Senate. It was with a keen pleasure that we have crossed the frontier of Finland and admired the glorious views of your country and the great progress in your civilisation.

Allow me, Senator, to avail myself of this moment, so particularly solemn for those come from Hungary, to greet you in the name of a sister-nation to yours ; allow me, besides, to tell you that we are enraptured with the superb reception you have prepared in honour of the members of the Congress and that we are proud to see at this gathering the Senate of Finland represented just by you, Senator, one of whose daughters is married to one of our countrymen. Finally, allow me to tell you that in this country of a thousand lakes, although the conditions of its climate may be different, and there are no vast and hot steppes to be found here as in our native land, and although the tall mountains of our own dear country are here replaced by majestic forests and by lakes of azure colour : allow me, I say, to believe that we are here at home.

Independently of the feelings that rise within us as Hungarians, I believe I interpret those of all the members of the Congress assembled in this place when I beg you to accept our sincere thanks for your charming welcome and I call upon you, ladies and gentlemen, to raise your glasses to the welfare, prosperity and the undisturbed and pacific development of the Finnish people.

Long live Finland ! Long live the Finnish people !

In the name of the General Presidency of the Congress, Mr. **MERCZYNG**, Actual Councillor of State, Engineer and Pro-

fessor at the Institute for Ways and Communications, expressed warm thanks to the Senate of Finland as follows : —

*Senator,
Ladies and Gentlemen,*

I had the honour of acting as intermediary between our Organising Committee and the Imperial Senate of Finland in the arrangement of this brilliant excursion, and you will allow me, gentlemen, to express our feelings of deep gratitude. For this magnificent reception, amidst smiling woods and facing these, perhaps the most beautiful, falls in Europe, we are indebted to the Finnish authorities, to the Senate of Finland. I am not exaggerating the impression it has made on all of us and the feelings we all felt, when I state, that the members of the XIth. Congress will cherish imperishable memories of this glorious day.

Long live the Senate !

Long live the Finnish authorities !

Long live the organisers of the excursion, Messrs. Ahonen and Lindqvist !

Major HANSEN, on behalf of the Swedes then delivered in German a speech, the English translation of which is as follows : —

Ladies and Gentlemen,

The feelings of gratitude, we are all imbued with as members of the Congress, have already been expressed in eloquent terms by the representatives of several countries. Allow me, nevertheless, on behalf of the Swedish members who are taking part in this interesting trip, to render sincere thanks to the government of Finland and to our Finnish colleagues for the brilliant and cordial reception they have given us. Solid ties attach us Swedes to the inhabitants of this country of lakes and fairies ; the two peoples are united by memories, by a common progress on the path of civilisation and by a common language.

We are also enchanted with being able to admire one of the most beautiful sights of this superb country, and having been able to make the acquaintance of the hostesses and hosts who have received us in such a charming manner. Visiting the Saima canal has also been of great interest to us, as one of our

most brilliant Swedish engineers, Nils Ericson, has greatly contributed towards the realisation of this master-piece of engineering of the middle of the last century. We have been able to admire a work, which in spite of the modifications it has undergone, still fulfills completely its purpose and has so much enriched the country of Finland with the benefits of water communication.

We have not only an agreeable mission to fulfil but also a duty to perform when on this spot, on the very banks of the grand Imatra Falls, which are, so to say, the concentrated picture of the power and beauty of this country, we express our sincere thanks to those who have prepared for us this reception and raise our glass to the prosperity of the Finnish nation and to the health of those of their representatives, who are among us !

Ladies and gentlemen, I beg you to join in hearty toast which we Swedes have the honour to drink to the Finnish people and their kind representatives on this charming trip.

Svenska Kamrater ! En fyra-feldigt socurted lefre för gende Finland och för den finska verdumer och vänden ! Lefre de !

Mr. RÉSAL, Inspector General of Bridges and Roads, whose popularity as builder of the Alexander III. bridge is great in Russia, voiced the French sympathies, and Mr. Maganzini the best wishes of the Italian members of the Congress for Finland.

Mr. COLETTA, Section President of the Supreme Council of Public Works in Rome, delivered in his turn the following speech in Latin : —

*Gracious Ladies,
Eminent Senator,
Gentlemen,*

In an assembly representing so many tongues you will no doubt grant me leave to make use of the Latin idiom to render thanks. To you, then, Imperial Senate of Finland, and you also, Organising Committee of this Congress, I offer on behalf of the sons of Italy and of Rome, their capital, this tribute of gratitude and beg I you all to raise your glasses to the prosperity of Finland. Your healths !

Mr. LÉON GÉRARD, on behalf of the Belgians, spoke in high-flown terms of the great esteem the Finnish people have won for themselves on account of their intellectual culture, their young school of art, their remarkable legislative measures in the interest of the rights of women, the like of which can only be found in certain States of America. He pledged the ties of affinity and good understanding between the Belgian and Finnish peoples.

Mr. DE JONGH, on behalf of the Netherlands, Mr. BUBENDEY, on behalf of the city of Hamburg, and finally a representative of England briefly wound up the long and interesting series of toasts, which were loudly cheered and during which champagne flowed copiously into the cups.

A ball followed ; it was very animated, very gay. And people left to see once more the awe-inspiring falls and to listen to the wild music of the torrent.

At 1 o'clock in the morning, when the guests returned to the railway station and lay down in their berths in the sleeping cars, dawn began to rise behind the rustling curtains of the birch-trees, the gnarled oaks and the darkpatches of fir-trees.

What a beautiful country !

Imperial Reception at Peterhof

VISIT OF THE CONGRESS TO PETERHOF

H. M. the Emperor granted to the representatives of the XIth. Congress of Navigation the favour of a solemn reception, at the palace of Peterhof, fixed for Wednesday the 22nd. May/5th. June.

The guests were : the first delegates of the various States, the Executive Bureau and members of the Permanent International Committee of the Congress of Navigation, the Presidency of the Organising Committee and his secretaries, the presidents and vice-presidents of the various Sections.

At 10 o'clock in the morning, those invited assembled at the Baltic Station and took their seats in a special train which started at 10.20.

On arrival the court carriages, in a few minutes, conveyed

to the Palace the representatives of the XIth. Congress, who were joined by H. E. the Minister for Ways of Communication and H. E. the Deputy-Minister of Marine as well as the high officials of the Emperor's Court.

After passing through all the magnificent suites of rooms, they reached the reception room, an immense hall, magnificently decorated, where under the direction of the High-Marshal of the Court they separated themselves into groups representing the various nations. It was understood that the first delegate of each country was to be presented to the Emperor and was to do him homage on behalf of his brother-delegates.

Punctually at noon H. M. the Emperor entered and the ceremony took place in accordance with the pre-arranged programme. After the presentations had been made, His Majesty exchanged some words with extreme good grace with the representatives of each nationality, asking questions from one and another and listening with marked interest to the replies given to his queries.

More than an hour was spent in this manner when H. M. the Emperor respectfully saluted and retired.

The doors of an adjoining room were then thrown open, where tables were laid for a sumptuous repast.

The representatives of the XIth. Congress were invited to take their seats at the tables.

At the central table the High-Marshal of the Court, Prince Dolgorouki, presided and had on his right the Minister of Greece, Baron Quinette de Rochemont, H. E. the Minister of Ways of Communication, Mr. Brockmann, chief of the Spanish delegation; on his left sat Mr. de Kielmannsegg, Governor of Lower Austria, Admiral Duplessis de Richelieu, representing Siam.

At the neighbourhood table H. E. Count Hendrikoff, Grand-Master of Ceremonies, presided having on his side Mr. Dufourny, General Secretary of the Permanent Committee of the Navigation Congress, H. E. V. de Timonoff, General President of the Congress, Mr. Charguéraud, Director in the Ministry of Public Works of France, General Pétroff, Section President of the Imperial Council, etc.

In the course of the meal, H. E. Prince Dolgorouki drank toasts to H. M. the Emperor, to the Chiefs of the States repre-

sented and the members of the International Permanent Association of Navigation Congresses.

Baron Quinette de Rochemont, as senior in age, responding on behalf of all those invited, drank the health of H. M. the Emperor and thanked the High-Marshal of Court for the toast just heard in honour of the Permanent Association.

At 2 o'clock, Court carriages conveyed the representatives of the Congress back to their special train with the same ceremonial as on arrival.

The next day, Saturday the 23rd. May/6th. June, all the members of the Congress were invited to visit the Imperial Gardens laid out by Peter the Great in imitation of those at Versailles, the Monplaisir Palace and the Grand Palace at Peterhof.

Boats were placed at their disposal.

But during the night from Friday to Saturday a strong blizzard, following brusquely upon the warm days visited St. Petersburg and its neighbourhood, covering with hoar frost the flower-beds on the lawns and the new foliage of the grand trees.

This blizzard drove out the tide to such an extent, that the water level in the Neva fell as much as 5 feet — a phenomenon which had not occurred since 1742 — and in consequence all navigation was stopped and the members of Congress had to be conveyed by special train.

The Court carriages with the coachmen and footmen in liveries, were waiting at the station and in view of the great crowd of visitors other vehicles had also to be pressed into service in great numbers.

After visits to the gardens of Marly and Monplaisir, a sumptuous luncheon was served in the very rooms of the Grand Palace where on the previous day the first delegates and members of the International Committee had been presented to H. M. the Emperor.

The superb suites of rooms were then wandered through and the members of Congress returned to St. Petersburg filled with astonishment at the sights they had seen and touched by all the acts of thoughtfulness of which they had been the objects by order of H. M. the Emperor.

The Congress Dinner.

The traditional dinner, at which all members of the Congress before it closes gather together, took place on Friday evening the 23 May/5 June in the vast hall of the Naval Cadets.

The General President, H. E. V.-E. DE TIMONOFF, drank the health of the chiefs of the States represented ; Mr. DUFOURNY, General Secretary of the Permanent International Commission and representative of the Executive Committee drank that of H. M. the Emperor.

Prince KHILKOFF, formerly Minister of Ways of Communications toasted the members of the Congress, and Mr. ODIER, the Swiss minister raised his glass in honour of the ladies.

After a toast by General WEINDRICH, Deputy of H. E. the Minister of Ways of Communication, Mr. MALLET, member of the Chamber of Commerce of Paris delivered the following speech : —

Ladies and Gentlemen,

No doubt many of you have asked the question how it is that so many who are not engineers practising in that particular branch, or as a matter of fact are no engineers at all, attend this Congress, which only deals with questions connected with special works.

Evil tongues whisper into my ears, that those people have been attracted to the Congress by the prospect of the journey and the hope, in reality surpassed, of a charming reception.

Without shutting my eyes to the fact that there is some truth in these allegations as regards those sentimental considerations, I am sure, others of a more practical value have intervened, in virtue of which I represent here the Chamber of Commerce of Paris.

Engineers do not carry out works for the sole purpose of showing the activity of human intelligence, in one of its most splendid forms, nor merely to acquire fame, nearly always well earned but often very costly.

Whether they drive piles, or construct drainage works, or build quays, locks or slips for repairing boats, these works are only means to an end.

And the end is to make travel and transport quicker, more comfortable, less costly and more effective.

The results, which can be appreciated by one without being of necessity a specialist, we have studied so far as Russia is concerned, first of all in the booklets which have been distributed with an unusual and very welcome liberality.

Next we have seen those results with our own eyes, as far as St. Petersburg and its neighbourhood are concerned, with a certain amount of astonishment, but with profound and tender satisfaction.

They have, indeed, proved to us an economic development, which cannot be gainsaid and testifies to progress.

I wish very sincerely, very cordially, that Russia having passed through a period of trials, her material prosperity should assume the fullest dimensions that are in proportion to the extent of her territory and her resources, and which are deserved by the brilliant intelligence of her engineers and by the devotion they have placed at the disposal of their native country.

Next, Mr. MAGANZINI, Italian delegate, drank the health of the organisers, and Mr. UCHIDA, the second Japanese delegate, toasted Russia, finishing with the call *Banzai*, which was repeated by all the Japanese delegates present. Mr. BELEUBSKI raised his glass in honour of the foreign engineers, and Mr. EGAN, a Hungarian delegate, greeted the Russian engineers.

Mrs. OCKERSON concluded, speaking in English, as under, with emotion and a rare rhetorical talent, about Russian and American sympathies.

At the urgent request of our distinguished President, Mr. de Timonoff and others, who sit at this presidential table, where we are honorary guests, I will make an effort to respond to the sentiments of goodwill towards America, so graciously expressed by Prince Khilkoff. I am happy to have one more opportunity to thank you, hospitable and generous Russians, for all you have done for your guests at this great Congress. You have been indefatigable in your solicitude for us, and your efforts have been crowned by signal success, with the help of capable

and charming beauties, who have never, not for one moment, ceased to look after our comfort. We cannot sufficiently thank these ladies and gentlemen. We have travelled six thousand miles to be with you on this grand occasion, and every minute has been to us one of joy without a tinge of regret. Even before, our hearts were filled with affection for the Russians, because at a for us critical moment, your generous people were the first to show us sympathy. We wish we could see the happy day when we should be able to welcome you all on American soil. At all times in all places, where our dear starspangled banner shall float, peace and goodwill to Russia.

After dinner there was a ball, led by General Wendrich, in which all ladies and the greater number of assembled guests took part, and especially so Prince Khilkoff.

Excursion to the Baltic Ports.

HELSINGFORS, RIGA, WINDAU, LIBAU.

The excursionists, close upon eighty in number embarked on 25 May/7 June towards 5 o'clock in the evening on the *Ilmène* and the *Saint-Petersbourg* moored at the English Quay. The two boats were to take them to the anchorage off Cronstadt, on board the Transatlantic steamer *Moskva*, which drew too much water to be able to steam up the Neva or even to enter Cronstadt Bay. The excursion was under the direction of State Councillor de Roummel, president of the second section of the Congress, who was accompanied by Rear-admiral Niedermüller, President of the Committee of the Naval Volunteer Fleet who placed the *Moskva* at the disposal of the excursionists.

The *Ilmène* steamed down the grand Neva, passed in front of the basins of the Port of St. Petersburg and entered the channel. In the distance, on the wooded shore of the gulf, can be seen the convent of Saint-Sergius, Strielna, Mikhailovka, Renella, Peterhoff-Oranienbaum. Cronstadt is approached, the sharp outlines of which stand out boldly in front of a sky lit up by a glorious setting sun and remind us of the picture of Venice as seen from the Lido. Round the island, the girdle of forts, low down near the waterlevel, resembled in the distance a fleet of gigantic gunboats.

Here we are in the military harbour of Cronstadt. Some distance off lies at anchor, with steam up, the ship awaiting us. The *Moskva* is a Transatlantic liner of some 8,430 tons, engaged in the regular service between Libau and New-York, calling at Rotterdam. It is the former *Fürst Bismarck*, of the North-German Lloyd, built at Stettin in 1891 and converted into an auxiliary cruiser. Her length is 504 English feet, her beam 57 and she draws 28 feet and a fraction. Her engines, of 16,000 horsepower, easily develop 20 knots.

A steamtug transfers the members of the Congress and their luggage to the *Moskva*, where they are received by the commandant, Captain Schiekh-Aschiry of the Imperial Navy and his officers to the strains of the band of the Volunteer Fleet. The liner weighs her anchor while the cabins are assigned. As there is room for 600 passengers and the fittings — at least those in the first class — are luxurious, neither space nor light having been stinted, everybody is very comfortably settled.

The night is superb. It remains light like twilight in summer in less northerly regions. On deck, at midnight, one could easily read a newspaper. Just in the north a broad rose-coloured band on a pale golden background marked the azimuth of the sun; it recalled the recent setting of the orb and announced the approaching dawn. The sea was very calm and remained of a greenish hue of a delicate shade. No land was visible in the east, south or west; only a dark line on the lit-up side of the sky marked on the farthest horizon the coast of Finland.

When the passengers reappear on deck the next morning, Monday, Helsingfors is in view, and the *Moskva* proceeds with prudent caution slowly in a sea dotted with numerous « scherres », i. e. tiny islets of granite, like everywhere on the Finnish coasts. At 10 o'clock we steam through the narrow passes of the fortress of Sveaborg; a quarter of an hour later we drop anchor in the middle of Helsingfors Roads enclosed on every side either by the coast, or wooded islands, or large blocks of granite appearing amongst the tall trees. One could imagine oneself at the centre of a vast lake, nearly circular in outline, but with very irregular edges. The city and its environs present an admirable scenery.

The members of the Congress embark on a small government steamer, the *Jupiter* at 11 o'clock, which takes them on a trip

round the Kronbergsfjarden and the Norra hamnen, where some men-of-war can be seen, cruisers or despatch boats, torpedo-boats and torpedo destroyers. In the distance the cannon is booming ; it is the artillerymen of Sveaborg who are at practice firing upon a moving target. After having steamed round the Skatudden, the passengers land at the bottom of the Södra hamnen, on the Alexandra Quay close to the Salutorget, where they are received by the Governor of the province of Nyland. Numerous « akaras » await them here for a drive about the town as far as the Djurgarten ; they drive round the lake and return to the harbour to mount the heights of Brunnspark, from which the view of the sea and islands is really fairylike. A luncheon is offered to the Congress by the State of Finland in the Brunnshuset (the summer theatre).

Mr. MEKHELIN, the retiring president of the Senate drank the health of the Tsar of Russia and the chiefs of the nations represented at the Congress. This toast was very much applauded.

Mr. Mekhelin, continuing his speech, said in substance : —

Gentlemen,

You have arrived at Helsingfors at a time when the city does not present its usual animation, because there are, so to speak, no inhabitants left. The Whitsuntide holidays, coinciding with the beginning of summer, have tempted everybody into the country. This is the reason, why this locality, so animated as a rule, is to-day so deserted.

I believe that the geographical position of Helsingfors is worthy of your attention. On mounting to the astronomical observatory, from which the sea and the coasts can be seen as far as the eye can penetrate, you have been able to see a short time ago that the city has three ports and an extensive anchorage, sheltered by the islands against the storms of the open sea. Towards the east and towards the west, thousands of tiny islands form a shelter along the coast protecting the small coasting vessels. You will, therefore, notice that nature has greatly favoured the capital of Finland in respect of the conditions of the shipping trade.

The sea does not present itself to our eyes as an abyss, but as

a wide road which facilitates our intercourse with other towns. It only takes twenty-four hours from here to Stockholm, in thirty-six or forty-five hours you can get to Copenhagen or Lubeck, and in a few days you can reach the English ports. It is not only merchandise that we are able to exchange thanks to navigation. The passengers bring us new ideas also, things often more precious than the rest.

Your Congress is one of those manifestations of international intercourse which characterise and do honour to the times we live in. The representatives of various races offer each other a helping hand, they enlighten one another, they work in common at the solution of problems which are of interest to all mankind. Congresses help to banish from the civilised world exaggerated forms of nationalism and chauvinism; bonds of friendship are tied at them between country and country. In one word, technical or economical congresses tend to realise that beautiful dream which is called the fraternization of peoples and universal peace.

The speaker then entered upon considerations as to the method of organising international Congresses which he would like to see more democratic. To admit to them men who work with their hands so that they might mingle with the technical experts, that would be to work in the direction of social evolution. Mr. Mekheline then finished his speech with the following words : I thank you for having come to Helsingfors and regret that your visit is so short. I raise my glass in honour of our guests and all the nations represented here.

Mr. V. J. DE ROUMMEL replied as follows : —

Gentlemen,

It is now the second time that the XIth. International Congress of Navigation is enjoying the hospitality of Finland.

In the name of the Organising Committee I thank Helsingfors for the handsome reception prepared for us. I am sure I am voicing the sentiments of all the members of the Congress when I raise my glass to the prosperity of the Grand-Duchy of Finland and the beautiful city of Helsingfors,

These words were received with long continued applause and then Mr. MICHAELIS of Breslau made the following speech in German : —

I take the liberty to speak on behalf of all the foreign members of the Congress who have come from all parts of the globe to get to know Russia. The visit to your beautiful country and this magnificent city is now coming to end. This sun which shines on us, your amiable reception, the beauty and cleanliness of this city, so much favoured by nature and architecture, all these are to us subjects that enrapture. Intellectual culture has here been pushed very far ; in many points, you have even out-distanced us. You have given your women the right of sitting in parliament, and your University is frequented by four hundred young girls. We are learning here something to-day. It is for this that we thank you from all our hearts and wish you still greater prosperity.

For Finland, for Helsingfors and for your Senate ! Hurrah !

Mr. NAUDÉ, of Lille, added a few words. He thanked the Committee who organised the reception for having invited the Finnish ladies, and regretted that none of the ladies belonging to the Congress were present as they had all joined the trip down the Volga. Mr. Naudé in conclusion drank the health of the ladies of Finland, and the prosperity of the Grand-Duchy of Finland and of the beautiful City of Helsingfors.

Mr. de Roummel and Rear-admiral Niedermüller then invited all participants to come on board the *Moskva*, where the wine of honour was offered and a small dance was arranged on deck. The invited guests went ashore shortly before five o'clock and the Transatlantic liner weighed her anchor for Riga.

The *Moskva*, having been delayed on the way, did not arrive off Riga, the next day, Tuesday June 9th., till about quarter past two in the afternoon. She dropped her anchor in the bay about 3 o'clock at about a mile from the mouth of the Düna. Three steamtugs, the *Hernmarck*, *Jacob* and *Beta*, bedecked with streamers and hunting, came out to meet the liner and took off the excursionists to convey them to Bolderoo Haven, where a town-steamer awaited them. The steamer made the tour of the Marine port of Riga, where already enormous piles of timber could be seen, although the proper timber-port is really situated

higher up the river. The excursionists landed at 5 o'clock and were conveyed in carriages to the *Imperial Garden*, where the representatives of the municipality awaited them in the persons of Mr. G. Armitstead, the mayor, and Messrs. von Haffner, Erhardt and Carlberg with Mr. Konstantinov, Chief-Engineer of the Port of Riga ; also the representatives of the Committee of the Stock-Exchange, Messrs. Larsson, Kerkovius, Pabst, Fleischer and others. The excursionists had some refreshments and then drove back to see the town. They were shown the cathedral, where an organ-concert was given for their benefit. Other churches were visited, also the Great Square and the central quarter of the Town.

At 7 o'clock a brilliant reception was given to them by the Black-Head Club in the sumptuous localities of the famous « Schwarzhäupterhaus » (House of Blackheads). Mr. Wippert spoke on behalf of the guests to thank the Blackhead Club for their hospitality to the members of the Congress, who were then taken to see the timber port up the river.

At 8 o'clock there was a garden-party at the Thorensberger Park. During the function, Mr. ZVEGUINSEFF, the Governor of Livonia, drank the health of H. M. the Emperor of Russia « the high-protector of the Congress, which has done us the honour of sending their delegates here ». The toast was cheered.

Mr. ARMITSTEAD, Mayor of Riga, delivered the following speech : —

We are very happy to see among us the delegates of Western Europe. It is towards that region and towards its civilisation that our eyes are directed. Unfortunately your visit is very short ; but at any rate you have been able to see something here : the timber-port, the cathedral, St. Peter's Church, the House of the Blackheads. And let us hope you will take away with you a good impression of Riga.

Mr. V. J. DE ROUMMEL expressed thanks on behalf of the Committee of the Congress and regret that circumstances did not permit the members of the Congress to stay longer in Riga. Messrs. WIPPERT, Austrian delegate, and RODJESTVENSKY also spoke.

The festivities lasted till after midnight. Special trains of the

electric tramway conveyed the excursionists back to the harbour, where two steamers took them back to the *Moskva* to the strains of a town band. It was after 2 o'clock in the morning when the Transatlantic liner weighed her anchor.

On Wednesday, June 10, towards noon the steamer arrived off Windau. This port sent quite a small flotilla of steamtugs and yachts, all festive and gay with streamers and bunting, to meet the excursionists. One of these vessels was the *Vladimir*, a huge ice-breaker belonging to the Ministry of Commerce and employed in regular service round Domesnäs Point. The ice-breaker took on board the excursionists and proceeded up the Windava, followed by the steamers *Neptun*, *Solid*, *Windava*, *Zarintsa* and *Kolouchan*.

A timber port almost as large as that of Riga was crossed ; it extended several kilometers up the river. At half past one, the trippers landed and got into open carriages which took them at a fast trot round the town and its neighbourhood. The *Vladimir* then conveyed them back to the right-hand bank of the river and landed them close to the Moscow-Windau-Rybinsk railway station.

A banquet was then given in the dining rooms of the railway station. When desserts were reached, Mr. WEBEL VON KR GER, the harbour-master, welcomed the guests in a speech in Russian and Mr. PAUCKER replied.

Mr. PISTOLKORS, engineer of Ways of Communication at Windau, spoke next, both in Russian and French. The English version of his speech is as follows : —

Gentlemen,

In welcoming you to the port of Windau I hasten, on behalf of the Moscow-Windau-Rybinsk Railway Company, to express our lively satisfaction that the members of the XIth. International Congress of Navigation, those who have chosen the trip from St. Petersburg to Rybinsk and Moscow, as well as those who have elected to visit the Baltic ports, remain in constant touch with the railway system of the Company.

While conducting the traffic of the regions of the Volga and the Kama as far as the Baltic Sea on a railway net of more than 2,500 kilometers, the Company at the present moment is

making preparations to push a line southwards, towards the Black Sea, the first length of which, as far as Vitebsk and about 500 kilometers long was opened a few years ago.

We hope, gentlemen, that when you come back again to Russia to attend another Maritime Congress ere long, the Moscow-Windau-Rybinsk Railway Company will be in a position to take you not only on your trip from St. Petersburg to Rybinsk or from Windau to Moscow, but carry you on their own lines all the way from St. Petersburg to Kiev, the mother of Russian towns, as the place is called by the ancient chroniclers, and even beyond, to Odessa, on the old Pontus Euxinus of the ancient Greeks.

To your healths, gentlement present belonging to the Congress, and also the health of those who have not been able to join in our pretty excursion.

Mr. DE ROUMMEL, in French, and then in Russian, expressed thanks on behalf of the Committee of the XIth. Navigation Congress to the representatives of the town, the port and the railway company for their excellent reception. He emptied his glass to the prosperity of the commercial port of Windau, a port with a great future. The speaker then toasted the Windau-Moskow Railway Company.

Mr. RAGOCZY spoke next (in German) : —

Gentlemen,

The greater part of the members of the XIth. International Congress of Navigation have gone down the Volga, the largest river in Russia, and to Moscow, to the very heart of this grand country.

It is natural that the majority, anxious to visit a new world, have been attracted by that unknown region. The wish to know Russia and its inhabitants explains why you see but a small fraction of our Congress inside your walls. Although we were fully prepared to see many things here that were not new to us, we felt bound to accept your cordial invitation. An intercourse of centuries unite Western Europe with the ancient towns of the Baltic and more than one of us, when entering

this port to-day, was able to greet his own national flag. It gives us pleasure to state that you have known how to safeguard duly our interests and that you have received and treated our ships with many kind attentions.

If anybody should pretend that the Baltic is a dead sea having lost its mundane economical importance picked up by her luckier sister, the North Sea, our eyes have proved to us the contrary and convinced us that everything here throbs with life and movement. Everywhere, round us, a brisk trade is carried on, an intensive traffic is visible; we see new installations opened and new ventures in preparation for another spurt. As regards ourselves, we shall not fail to tell them at home, that the Baltic Sea is not at all dead; we shall announce it in a very loud voice that a great future is in store for it and it will be called upon some day to play an important part in the international traffic.

By admiring here the magnificent port of Windau, its great navigable river and the new railway connecting the town with the centre of the empire, we understand how the inland navigation, the sea-navigation and the railway cooperate in mutually fertilizing their work. Here as elsewhere, the intelligent collaboration of the Government, the Municipality and of commerce was the essential condition to bring about this neat result. Consider yourself lucky in having the untiring activity to reckon upon which your Government displays for the improvement of the port of Windau. We all wish to see these efforts bear fruit and we generalise voluntarily this unanimous wish by expressing a hope that Russia will henceforth enjoy a long spell of peace and happiness. Long live Russia!

After the banquet at Windau, the members of the Congress divided themselves into two groups. One of these consisting of twenty-four members took their places in two cars kindly placed at their disposal by the Moscow-Windau-Rybinsk Railway Company. They left Windau at 7.50 in the evening and arrived at Moscow two days after, on Friday at 10 o'clock in the morning. They met there the excursion party from the Volga, who had arrived the previous evening from Nijni-Novgorod.

The second group consisted of those, who wished to go through the whole programme arranged for the excursion to

the Baltic. The members of this group returned to the *Moskva* after a walk in Windau and on the South Breakwater of the Entrance Haven.

On Thursday, June 11, at 8 o'clock, the *Moskva* weighed her anchor and started for Libau.

During the last luncheon enjoyed on board the liner Mr. BIERMANN, German Consul at St. Petersburg and Don MANUEL MAESE, Director of the Works of the Port of Tarragona (Spain), drank the health of Messrs. de Roummel Senior and Junior, who had so well organised the excursion.

At 1 o'clock the *Moskva* entered the fairway leading to the commercial port of Libau and made fast at the *Reidowya* quays.

The Vice-Governor of Libau, Prince KRAPOTKINE and the municipal authorities stepped on board to greet the members of the Congress. The mayor, Mr. Dreyersdorf, welcomed them and invited them for the evening to a banquet arranged in their honour at the *Kurhaus*.

At 2 o'clock, the excursionists embarked on the ice-breaker *Ledokol 2*, which waited for them in the winter-harbour and took them on a trip through the various basins of the commercial harbour and the military port. They noticed the dry docks situated on one of the banks and the *Yermak*, the powerful ice-breaker of the Baltic ports. At 2.50 arrival at the torpedo-boat depot; reception by Admiral Grigorovitch, commanding officer of the military port, formerly captain commanding the *Tsesarewitch* and naval prefect of Port Arthur at the beginning of the siege. An interesting demonstration : a torpedo-boat is placed on trucks in a floating dock, deposited on to a track and run up on to the quay.

At 3.40 back to the steamer *Ledokol 2* and departure for the *Barrack Quay*. At 4.20 departure by rail to the Naval Casino. At 4.30 visit to the garrison church, when alighting from the train; and after that a brilliant reception at the Naval Casino by the naval officers and their ladies. Luncheon was served to the members of the Congress and several toasts were drunk, especially that by Admiral GRIGOROVITCH (in Russian) to wish the members of XIth. Navigation Congress a prosperous voyage and to express a hope that they carry away with them a good impression of Russia; another toast by Mr. DE ROUM-

MEL, who drank the health of the naval officers and especially that of the Port-Commander ; finally Mr. OLKHINE, Privy Councillor, drank the health of the defenders of the port, of its builders, as well as that of the ladies.

Admiral GRIGOROVITCH then drank the health of the Tsar — the military band playing the Russian Hymn — and afterwards the health of the members of the Congress and of the Organising Committee.

Mr. WIPPERN returns thanks for the great Russian hospitality and drinks to the prosperity of the navy.

At 5.30 the members of the Congress left the Naval Casino to re-embark on the *Ledokol 2* at the Imperial Landing-Place. The steamer took them back to the winter harbour, from where the members who were going abroad during the night, about twenty in number, went back on the *Moskva* to make their preparations for the departure. It was necessary to transfer their luggage to the special train which was to convey them to Eydtkuhnen ; then they embarked on a steam launch which conveyed them to the tramway terminus at the landing place in the town harbour and they rejoined at 8 o'clock at the « Kurhaus » (the Town Casino) the other members of the Congress.

Grand banquet of 250 covers in honour of the members of the Congress, the Vice-governor, Prince Krapotkine occupying the chair.

Various toasts when desserts were reached. The Vice-governor drank the health of the Tsar, and then that of the delegates of the various nations represented at the Congress.

He expressed on behalf of the Governor of Courland, detained at Mitau, the satisfaction he felt to see the members of the Navigation Congress visiting the Baltic ports and drank their health.

The Mayor of Libau, Mr. DREYERSDORF, delivered the following speech (in German) : —

On behalf of the town of Libau I thank the members of the XIth. Navigation Congress for the visit they have paid us. Our harbour, although of recent construction only, has already

EXCURSION ON THE VOLGA : A view on board the principal boat the *Graf*.



I. Mr. V. E. de Timonoff, General President of the Congress.

grown important, the last returns showing a traffic of 70 millions of rubles. An intense commercial activity has set in at our place and the attraction of the sea is the common bond which unites us all in this movement. It is with these sentiments that I raise my glass to the health of the members of the Congress.

Mr. MANNHEIM, Vice-president of the Stock-Exchange Committee then spoke (in English) : —

Those who have come here will have seen that Libau deserves a visit. The town is not very large but it is in communication, by rail and by sea, with the whole world. We reckon, therefore, upon a much larger development and wish that your visit may have a good influence. Hurrah !

Mr. NAUDÉ. — The Congress was closed on Sunday, but the festivities have continued and are about to terminate on the Baltic with this grand feast. Many of our colleagues have preferred the trip along the Volga, but I doubt whether they had such a fine reception as ours.

Our trip has been enchanting ; we were charmed with our visit to Helsingfors, Riga and Windau. The goal of our voyage is Libau and we have seen here most interesting things : we have been through your port, were present at a most interesting display and have admired your vast installations. All this has touched us, but what has touched us still more, was your warm reception.

I thank, on behalf of my foreign colleagues, the authorities of the province, the town, as well as those of the navy and the Stock-Exchange Committee and drink to the prosperity of Libau.

Mr. ROJDESTVENSKY, engineer, thanked (in Russian) the Admiral for the permission given by him to visit the military port and the Vice-governor for the cordial reception of the members of the Congress.

Mr. NAUDÉ. — At the moment of quitting the hospitable soil of Russia we thought to send the following telegram to His Imperial Highness, the Grand-Duke Michael Alexandrovitch : —

The foreign members of the XIth. International Navigation Congress at the moment of quitting the soil of Russia where

they have enjoyed such sumptuous hospitality have the honour to beg your Imperial Highness to be good enough to accept the respectful homage of their warmest gratitude. (*Applause.*)

Mr. DE ROUMMEL than proposes to send the following telegram to the Governor of Courland :

The members of the Congress at Libau thank your Excellency for the kindness you have shown them.

The proposal was agreed to unanimously.

Two more telegrams were sent from Libau, one to the City of Helsingfors and another to the Municipality and the Stock Exchange Committee at Riga, thanking them for the good reception of the members of the Congress.

At 12.30 the excursionists left the « Kurhaus », some of them to go to Eydtkuhnen by special train the departure of which was fixed for 1.30 in the morning, others to spend the last night on board the *Moskva*.

Excursion on the Volga and to Moscow.

Of all the excursions figuring on the programme of the XIth. International Navigation Congress that on the Volga attracted the greatest number of members, so much so, that the list of participants, the number of whom had naturally to be limited, although to a relatively high figure (200), was already complete long before the opening of the Congress. In spite of the bad weather prevailing during the last days of the session,



Excursion on the Volga.
A portion of the fleet of the Congress.

which induced several members of the Congress to give up the idea of exploring a little the Centre of Russia, new applicants enrolled themselves in their places, and the special train waiting for the excursionists at the Moscow Station at St. Petersburg, towards 7 o'clock in the evening of May 25, was taken almost by storm. Accommodation, however, was found easily enough on the train because it only implied a single night spent on the trip to Rybinsk, where the excursion really commenced. The next day, about 11 o'clock in the morning, Ry-

binsk was duly reached. The train stopped a few minutes at the town station where a deputation of the local authorities exchanged civilities with the General President of the Congress. These finished, the train continued its journey to the landing place on the bank of the Volga, where the excursion boats were waiting decorated with oriflammes. There was an entire squadron of them : the *Graf*, a large vessel belonging to the Volga Navigation Company, hired for the excursion, and three boats provided by the Ministry of Ways of Communication. After steaming half an hour, the boats made fast in front of the *Hotel de la Bourse*, of Rybinsk, overlooking the riverbank which was covered with a crowd awaiting the arrival of the members of the Congress. To the strains of a band playing on the verandah of the Exchange, the travellers hurried on land and a few moments later the members of the large international family were all seated round the tables in the hospitable hall.

Mr. JOURAVLEFF, Honorary member of Committee of the Rybinsk Exchange delivered a speech in French, the English translation of which is as follows : —

Ladies and Gentlemen,

The members of the Exchange and of the Municipal Council of the Town of Rybinsk derive real pleasure to see the representatives of so many nations assembled here, all of whom are interested in the development and prosperity of commercial intercourse.

It is for the first time that Russia has the honour to greet so many strangers gathered to the International Congress of Navigation. It is perhaps also for the first time, that the majority of you, ladies and gentlemen, have visited our country. It is from the bottom of our hearts that we welcome you here, that we wish that your visit, although short, should teach you to understand and appreciate our native country.

We should have liked to give you a more brilliant reception, but our town is very small and our means are limited. On the other hand, we receive you with open cordiality, with all the sympathy Russia is able to show to friendly nations.

We are proud, ladies and gentlemen, that you have begun your trip on the Volga at Rybinsk.

Rybinsk is the first town on the Volga the commerce of which was already very considerable, comparatively speaking, at the end of the XVIIIth. Century.

It is here where the vessels of heavy burthen stop that come from the Caspian Sea, the basin of the Ural, from the provinces, so rich in cereals, in the Centre and the East of the Country.

It is here where they tranship all goods intended to be sent on as far as the White Sea and the Baltic.

The town of Rybinsk has contributed very much to the improvement of the conditions of navigation by having built at their own expense a harbour of refuge from the ice-floes carried by the river in the autumn and the breaking-up of the ice in the Volga in the spring.

The costs of its construction have reached the respectable sum of 1,875,000 francs.

But the progress made in the meantime in the building of vessels already calls for more expenditure and the Municipal Council is at the present time engaged in considering a scheme for enlarging the harbour with a view of giving access to the new large boats greatly exceeding in size those in actual use.

The exchange where you are now assembled, gentlemen, one of the oldest buildings in the country, as its dates from 1807, is a proof of the size our town had already reached a century ago.

The expenditure amounts to 800,000 rubles, that is, to about 3,000,000 francs. When Peter the Great planned to enlarge his empire, his purpose was not so much to add to its superficial area as « to open a window towards Europe » as our great poet Pushkin expressed it, in order to assure new outlets for the commerce.

When, in 1703, he laid the foundations of St. Petersburg, the town which, gentlemen, has had the honour to receive you, had to rise out of a swamp in a short time and in spite of all obstacles.

But the work of this man of genius was not to finish there. Being the master of the coast of the Baltic, his idea was to connect that seaboard with the centre of Russia in order to join it

with the Caspian Sea, in order to facilitate the transport of cereals and of numerous other commodities, forming the great wealth of the empire, to the other European countries.

The water transport being the most advantageous, it was first of all necessary to make inland navigation safe, to regulate the river courses, and to make artificial ways to connect the natural rivers routes. Nothing escaped the acute discernment of his vast intelligence. But the empire is great and life is short. A man's span of life does not suffice for carrying out such bold schemes. His successors continued his work.

The wife of Paul I., the Empress Mary was interested in the progress of navigation. A proof for this is the name given to the water route from Petersburg to Rybinsk : « Mariinskaïa Systema », literally the « *System of Mary* », starting from the Neva and ending at Rybinsk by way of a series of canals and the Cheksna.

These important works were only completed under Nicholas II. and they are still far behind the requirements to satisfy completely the wants of the trade of to-day. The transport of goods from Rybinsk to Petersburg is still far too slow. A quicker transport would involve considerable expenditure. We shall, therefore, not consider the works completed until the necessary improvements have been carried out so that a boat from Rybinsk to St. Petersburg will not take more than from ten to fifteen days.

Encouraged by the interest which the other nations of the world take in our public works, our government, we have no doubt, will push on with greater vigour the works which are wanted to ensure our commercial and industrial development.

If such a result is achieved we shall be indebted for it partly to you, gentlemen. And therefore, let me thank you for it in advance on behalf of the members of the Exchange and the Municipal Council of the town of Rybinsk. Let me express the hope that this visit will not be your last and that in a few years this town will have the honour to prepare for you a more brilliant reception in a new building, the foundations of which we hope to lay shortly.

In the meantime, ladies and gentlemen, let us drink to the prosperity of friendly nations, to the development of commercial intercourse, and the *entente cordiate* amongst all nations.

Mr. V.-E. DE TIMONOFF, General President of the Congress replied on behalf of the members of the Congress to the following effect : —

Ladies and Gentlemen,

It is a particularly agreeable duty I have to perform, when I have to act as the modest, but faithful and earnest interpreter of your unanimous admiration of the work of the inhabitants of Rybinsk, which we were fortunate enough to see this morning ; when I have to announce loudly how proud we are of the honours conferred upon the International Congress of Navigation and have also to express our sincere thanks for the cordial welcome with which the two local authorities, the Municipal Council and the Exchange Committee, have been good enough to receive us jointly in this town.

The brilliant speech of the Honorable Mr. Jouravleff, Chairman of this banquet, has given you a short review of the progress made by Rybinsk since its foundation. What beautiful conquests in the dominion of industry and transport ! What glorious strides in staking out the career of this inland port since its birth ! What undoubted successes in the future !

The inhabitants of Rybinsk were right in always having had unshaken faith in the men of their choice who watched over the cradle of this town, guided its first steps and brought it to its maturity.

As worthy sons of the old Russian soil, the inhabitants of Rybinsk did not content themselves with displaying their local patriotism by improving their town by means of works carried out on a large scale, but they have placed the clear perceptive faculty of their race at the service of the general navigation ; and, while augmenting without intermission the wealth of the nation, have by their cooperation with the Engineers of the State in carrying out the system of canals joining the Volga with the Neva, undoubtedly accomplished a work of solidarity and fraternity of world-wide importance.

The State engineers and the representatives of commerce and of towns, in our country, as elsewhere, very often join hands cordially in the pursuit of the same ideal : to fulfil manfully their duties as men and citizens, to cooperate to the best of their ability for the common welfare, to preserve and enlarge

their legacy of improved ways of communication. The courses we pursue, however, are very different. The engineers, tied up in the bonds of a narrow hierarchy and performing a rigorously defined task, devote all the resources of their intelligence and knowledge to the state, while the others retain their liberty, their independence, and take the initiative when bringing forward measures which are compatible with the material necessities of existence. Having myself for a long time worked hand-in-hand with these gentlemen of Rybinsk, I cannot but congratulate myself that circumstances have not prevented me from being present at these festivities presided over by Mr. Jouravleff to-day, whose share in promoting the prosperity of the town of Rybinsk is eloquently proved by the handsome portrait of him which the Exchange Company have placed in the hall where we are assembled.

I should blame myself, therefore, if I did not add my personal tribute by expressing the pleasure I feel in seeing in Mr. Jouravleff the realisation of the best aspirations of his fellow-citizens and I beg you to wish sincerely and warmly good luck to him and to the town so dear to him.

Mr. MAYER, chief of the river police of Rybinsk then delivered the following speech : —

Gentlemen,

I am deeply and sincerely moved by the thought of being able to greet you and to express to you my best wishes on the auspicious occasion of your stay in the port which it has been my duty to guard for one and twenty years. Rybinsk being the last inland port from which the corn is despatched to our seaports, it affords you an opportunity to admire the grand sight of innumerable boats laden with our agricultural produce and forming a long row of several kilometers. The fleet is not yet up to its full strength ; following the Volga from here down to Nijni-Novgorod you will have occasion to meet many more boats and all that you will be able to see here and elsewhere will prove to you, I hope, that, thank God, Russia is not in a state of decadency, that she is not in the throes of civil war, but on the contrary, her sons are enjoying peace and are engaged in productive work. Your truthful testimony, gentlemen, will con-

tradict the false tales fancied and spread by certain journalists and politicians, who unfortunately too often draw sad but at the same time untruthful pictures of our internal life. I raise my glass in your honour, gentlemen, you impartial witnesses, whose declaration and assurance of all that you are going to see on the Volga, this principal artery of our navigation, will greatly help towards establishing the truth about the results of our farmers work and the progress made in the means of transport of agricultural produce. Your health !

MESSRS. MALLET, DEKING-DURA and SANJUST DI TEULADA then, each in his turn, express thanks on behalf of the countries they represent to the Stock Exchange Committee and the Municipality of Rybinsk for their hospitable reception.

The hour of departure is approaching.

Before re-embarking the members of the Congress have a look round the town. At last, the trip down the Volga begins. The river, which at Rybinsk has not yet assumed its majestic dimensions, nevertheless begins to attract more and more the excursionists' attention, who are greatly interested in the river and the various kinds of craft we meet.

Unfortunately, the somewhat strong wind which in the morning seemed to have dispersed all the clouds, brought along with it others, and on their arrival at Yaroslavl in the evening, the travellers had to proceed to the rout in the townhall in the rain. The reception was charming. Mr. TCHISTIAKOFF, the mayor of the town delivered a speech of welcome.

Mr. DE TIMONOFF replied to the mayor's words of welcome as follows : —

Ladies and Gentlemen,

I have the very agreeable mission to thank the mayor and municipal councillors of the town of Yaroslavl on behalf of the members of the XIth. International Congress of Navigation assembled this evening at this beautiful and hearty gathering and representing here the various branches of human activity in connexion with navigation. It is a picture of the working world, the picture of the world that is not given to dote on

chimeras or utopias, that takes no interest in sterile discussions ; the world that remains faithful to the traditions of common sense, good humour and good taste ; the world that pursues its furrow with its eyes fixed upon the ideal of progress, of fraternity, of universal peace. A gathering of this kind is really in its proper place in a town the past of which is bound up with the destinies of a great Russian prince, like Yaroslav Moudry, a wise prince *par excellence*, who has laid the first foundations of the work of legislation of our country in the form of the Russian Code of the XIth. Century, of the « Russkaya Pravda », the Russian Truth, and was connected through the matrimonial ties of his children with the reigning houses of Sweden, Poland, France, Hungary and other countries. The hours we are able to spend within the walls of Yaroslavl are unfortunately too short to enable our friends from all parts of the world to form an opinion about the industrial, scientific and artistic importance of this town and her province so remarkable for the spirit of initiative and enterprise of its inhabitants. But we shall all carry away a valuable remembrance of the impressions gathered this evening during our stay among you and of the excellent reception prepared for us by the municipality of Yaroslavl. It is on behalf of the XIth. Congress of Navigation, of which I have the great honour to be the spokesman, that I greet the Mayor and Municipal Councillors of the town of Yaroslavl and that I raise my glass to wish her prosperity. May the town continue for many years to be the centre of an industrial, scientific and artistic life and of fruitful activity, the focus of free initiatives for the greatest prosperity of the country !

Other speeches followed, notably those of Messrs. GERMELMANN, SILENY and TCHISTIAKOFF.

It was raining but not sufficiently to prevent the excursionists seeing something of the town. It was very picturesque, this ancien town, the true centre of Russia, bearing the stamp of Russian antiquity !

The next day at rather an early hour, Kostroma was reached and after an hour's stay, during which the Congress members strolled through the town, they embarked on the local steamers and went to see the Ipatievski Convent, the cradle of the House of Romanoff. Received by the superior and the monks, the excursionists visited the cathedral famous for its ancient pain-



Kostroma. — Visit of the house of the first Romanoff.
at the Monastery of Ipatievsky.

tings and a handsome iconostase carved in wood, the museum and lastly the house where the first Romanoff lived with his mother at the time he was called on the throne of Moscow.

Something happened this day that was not prearranged. Although the visit to Kostroma was included in the programme of the excursion, it was timed for such an early hour that no other proof of hospitality was expected than a harangue of welcome, but the Kostromites managed to include a banquet to the Congress members in their town hall. And with such cordiality! Cabs and private carriages sent by people wholly unknown to the travellers were waiting for them on their return from the convent. A drive was arranged about the town, visiting the principal monuments before the guests settled down to the banquet. The latter was very sumptuous and very animated. The health of H. M. the august patron of the Congress was proposed by the Governor of the Province of Kostroma, General Vérétennikoff, who had practised for a long time the profession of an engineer.


Mr. DE TIMONOFF, the General President of the Congress thereupon responded as follows : —

Ladies and Gentlemen,

I beg your leave to reply on your behalf to the words of welcome just spoken by his Excellency the Governor of the province of Kostroma. These words, addressed as they were to a Navigation Congress, a body which owing to its very nature is necessarily in close connexion with technical science, are of special significance, his Excellency being himself an engineer and having practised for a considerable time that profession before he accepted his present administrative post. The programme of this excursion down the Volga, moreover, did not include the reception at Kostroma. True, we proposed to visit this town to admire its remarkable historical monuments, but we expected to do so at such an unusually early hour that it did not enter the Excursion Committee's mind to reckon on local hospitality. The flattering attentions of which you have been the objects on the part of the population of the town of Kostroma, who have placed carriages and guides at your

disposal to visit the town, as well as the banquet now offered to you by the municipality of Kostroma, are pleasant surprises not only for you, but even for the President of this Congress. I said « surprise », but felt immediately that I was wrong, as a moment's reflection would have prevented my making use of that word, knowing as I do the traditional hospitality of the inhabitants of Kostroma and their go-ahead spirit. These gentlemen, faithful to their traditions, did not wish to miss an opportunity of showing their feelings of esteem and fraternity towards the representatives of the various countries who are taking part in our excursion. They wished to unite with us in the work we are carrying on, which is not limited by the boundaries of a country. Being convinced that the progress resulting from the work carried on by the International Congress of Navigation is destined to be profitable to all nations on the globe and to improve more and more the social position, these gentlemen considered themselves bound to show their sympathy with our great international gathering and to encourage us in our proper sphere of activity. Knowing how much the advancements of science and industry are indebted to the beneficial influence of the good understanding between nations, the source of the world's peace, and also to engineering science, the Kostromites have kindly wished to give us one more opportunity to gather round the table of the universal family. On behalf of the International Congress of Navigation and its members who are present in such great numbers in Kostroma, I beg to thank most cordially the inhabitants of this town for their spontaneous and charming hospitality, assuring them at the same time that our stay in their town will be one of the most enjoyable memories of our trip and will contribute towards creating, strengthening and developing that good understanding among the nations, which is one of the principal objects of our work. Long live the town of Kostroma.

Several other speeches followed that of the General President. Messrs. HECHT, MAGANZINI and RÉNAL find words full of deep sentiment to let the inhabitants of Kostroma know, how charmed everybody was with the reception. Messrs. GOLOVANOFF and RASSADINE spoke with warmth and conviction of the durable impression which the passing through of the Congress will leave in the hearts of the Kostromites.



According to programme the boats should have called at two more places this day, namely at the village of Krasnoïe, where an exhibition and sale of small objects of gold and silver, manufactured by the peasants, was to be improvised on the landing stage ; and in the evening the town of Kinechma was to be visited. At the first-named place, the foreign members of the Congress were very much edified by an incident which was as much unforeseen as it was touching. The head of the district offered to the General President of the Congress the traditional Russian « bread and salt » and received from the latter the badge of the Congress.



The Congress members on the terrace of the Exchange of Rybinsk, cheered by the people.

About 1 o'clock the General President received a telegram which was the cause of our call at Kinechma, being of an altogether particular character. Mr. Prüsman, member of Congress, had just died at St. Petersburg after a short illness and a prayer for the repose of his soul was announced. When the boats stopped at Kinechma, the clergy of the cathedral were sent for, who to the mournful tolling of the bell went on the upper deck of the *Graf*. These affecting moments, while prayers were chanted under a pale sky of a spring night and touching orations were held in memory of the deceased

by the General President of the Congress and Mr. Germelmann, one of the chief delegates of Germany, produced a profound impression on all the members of Congress. A few minutes yet..... and the voyage was continued towards Nijni-Novgorod. One more stop to visit a « barge » constructed for carrying naphtha, of a tonnage of 450,000 pouds.

The night and the following morning, the last spent on the Volga by the excursionists, were splendid; the travellers crowded on deck to admire the river and its banks with the beautiful town of Nijni-Novgorod. The boats pass in front of the Sormovo workshops, the town and go further down the Volga as far as the celebrated sandbank called the « Calf-ford » or Téliatchy Brod. The promenade is slightly prolonged in order to collect all the excursion boats together and to make fast at Nijni shortly before 11 o'clock. After mutual introductions on the landing stage of the Ministry of Ways of Communication, the delegates of the local authorities stepped on the deck of the *Graf*, which conveyed the travellers to Sormovo. A train belonging to the works took them to the workshops. Work was only carried on in some of them as it was the dinner hour.

In one of the shops an exquisite luncheon was served.

When the time of toasts arrived, Mr. MOSCVINE, the manager of the works, in a speech full of cordiality gave expression to the deep satisfaction the management of the works felt at being able to welcome there so many men of distinction, engaged in navigation, and drank the health of the members of the Congress.

Mr. DE TIMONOFF, General President of the Congress, replying to the manager of the Sormovo Workshops thereupon delivered the following speech : —

Ladies and Gentlemen,

I have the great honour to reply on behalf of the XIth. International Congress of Navigation to the warm toast of the Manager of the Sormovo Company and to express, very sincerely and very warmly, our gratitude and sympathy as well

as our wishes to see this large company continue on the path of prosperity upon which it entered many years ago.

Navigation is intimately connected with the shipbuilding and engineering industries which supply the former with the necessary means of transport. For this reason the programmes of excursions during former Congresses included visits to large workshops. France has shown us the Creusot Works, Belgium the Cockerill Company's establishments, Germany the Krupp Works. The Organising Committee of the St. Petersburg Congress considered it wise to imitate these examples. They have made it possible for all the members of the XIth. Navigation Congress to visit the large shipbuilding yards at St. Petersburg, such as for instance the Nevski Works, the Baltijski Works, the Poutiloff Works. They are happy that at least a portion of the members of the Congress are to-day within the precincts of the handsome workshops of the Sormovo Company.

Although our visit here is of necessity very hurried, owing to the limitation of the time at our disposal, the impressions we are taking away with us of these works, where the largest boats used anywhere in the world on inland waterways are constructed, and which have provided the Volga with a large share of its passenger steamers, tugboats, barges and dredgers, are vivid, interesting and durable. We shall leave here with the profound conviction that the share of the Sormovo Works in the development of the Volga navigation is very great and that the future has in store even greater successes for these works. These successes we wish to them most cordially.

Mr. BLUM, an engineer, then spoke as follows : ---

Ladies and Gentlemen,

We feel highly honoured by your presence in our establishment and workshops and feel it our duty to give expression to the sincere feelings of pleasure your kind visit has given us. Here, in our place, you are on the largest river in Europe. It is our artery that supplies us with heat by bringing us thousands of tons of naphtha required in our industry and nourishes us with the corn from its banks. But the life you may observe in normal times on the Volga, such a busy life,

so full of movement, is not the work of a few years only : it is very ancient and nature has for a long time fought against human will. It required the cooperation of the labour of centuries and the engineer's skill to accomplish this great work. It required dredgers, powerful steamers and all the other craft you can see on these waters. Our works, which are the largest on the Volga, occupy one of the foremost places in the development of its commercial movement. A large number of our boats are afloat on its waters. Up to the present we have built more than 350 vessels of different sizes and types. The steamer *Graf* which has brought you here was built in our yard, and was turned out with seventeen sisterboats in one year by our works. The large naphtha boat you saw when you arrived, is one of eight built last winter, when sometimes the thermometer stood at 40 degrees below zero and a regular snowstorm was blowing. Generally, when studying the conditions under which the Volga navigation was developed, you will have before you something different from what you are accustomed to see in your own homes, but by communicating to us the results of your large experience and skill, you will be able to help us to advance a few steps in the art of shipbuilding. Allow me, Ladies and Gentlemen, to wish you best success in your researches which unite us under the banner of industry and for the welfare of the human race. I drink the health of the representatives of all foreign nations.

Numerous speeches followed, notably those by Messrs. BEKH-TEREFF, SILENY, MÉMORSAI, FLAMANT and HECHT.

In the afternoon we returned to Nijni, after having admired the drill of the Sormovo fire-brigade, from the deck of the *Graf* ; and as there were three hours left free until the beginning of the rout promised for the evening at the town hall, the members of the Congress hurried in small groups to view the town.

The reception in the town hall, at which all the members of the Congress and a large number of the inhabitants of Nijni-Novgorod were present in the evening, was very animated ; the rooms were decorated with flowers and plants.

Mr. MÉMORSAI, mayor of the town, addressed the members of the Congress in a brilliant speech, in which he dwelt upon

the important problems which navigation on the Volga has to solve in the interest of commerce and then welcomed the so highly qualified representatives of the science and art of navigation as were the members of the XIth. Congress of Navigation.

Mr.V.-E. DE TIMONOFF, the General President of the Congress delivered in Russian a speech of which the following is a translation : —

Ladies and Gentlemen,

You have come to glance, very hurriedly, it is true, at a portion of a navigable waterway which starts from the Baltic and ends in the White Sea and the Caspian Sea.

This is an immense connecting link, between Europe and Asia, between north and south, between the ancient world and the modern world, perhaps also between the world of to-day and the world of to-morrow. Before the birth of history, unknown peoples have traversed the various portions of this mighty highway but it was reserved to the grand monarch of our country to cut-through the isthmus which barred the route from sea to sea.

Honour and glory to his memory !

This is manifestly not the moment for quoting figures but in order to give you some idea of the importance of this route, an idea you have gathered on your trip down the Volga, it will suffice to tell you that a great number of steamers trading on the Caspian Sea have been built in shipyards in Europe and did not get to the place where they to work, until they had traversed, in the heart of Russia, the 4,000 kilometers which separate St. Petersburg from Astrakhan ; that, on the other hand, some sea-dredgers working at the mouth of the northern Düna, were built in Germany or in Holland and got to the place of their activity by passing along the Neva, through the junction canals and the river Düna itself.

The future in store for this immense navigation route is more imposing still. The Baltic branch, which some of you visited on your trip to Schlüsselburg, already forms what is almost a portion of the sea, barred, it cannot be denied, by the St. Peterburg bridges, which, however obstinate their resistance may be, are nevertheless bound to give way, some day, to the requi-

rements of commerce and modern progress. The extension of this sea-route northwards, made so easy by the existence of immense lakes in that region, is merely a question of time, which I should like to see cut short. The southern branch, the great and beautiful Volga, has its natural extension in the immense river Amu-Daria which coming down from the mysterious peaks of the Himalaya Mountains, on approaching the Caspian Sea, lost its way and flowed into the Aral Sea, but which the engineers will be able to divert back into its original bed.

And then, it will be possible to make the trip from the Baltic Sea to the Indian frontier in boats belonging to the inland navigation.

Having been obliged to devote many years of my work entirely to the making of the principal elements of the commencement of the Baltic branch of this immense navigation route, it may appear foolhardy on my part to consider schemes of such magnitude. But nothing is considered too bold since the work of universal navigation is directed by the Association of Navigation Congresses. Wherever this large and delightful Association goes, it assists, reinforces, concentrates all efforts to help forward the progress of humanity.

The « impossible » then becomes an accomplished fact !

This will account for the enthusiastic receptions of which you were the objects all along your trip down the Volga, from Rybinsk to Nijni-Novgorod, and which reached their climax to-day in the welcome you received from the municipality of this last town.

The Municipal Council of Nijni-Novgorod and the inhabitants of this beautiful town are, moreover, known for the place of honour they occupy at the Congress. For my personal part, I have had the great pleasure of working in Nijni-Novgorod at three different Congresses which have assembled in this town : the National Congress of Commerce and Industry in 1896, the National Congress for Water Supply in 1903, and the National Congress of Navigation, also in 1903.

I still retain the happiest memories of the cordial and gracious manner, in which the members of those gatherings were received by the Municipality of Nijni-Novgorod and those impressions of the past I now meet again at the splendid reception to-day.

Ladies and gentlemen, I propose a toast to the prosperity of the town of Nijni-Novgorod. And I couple with this toast the name of the mayor of Nijni-Novgorod, Mr. Alexander Mé-morski, who personifies so well the aspirations of our international work.

Mr. COLETTA, Italian delegate, then spoke in Latin to the following effect : —

*Gracious Ladies,
Gentlemen,*

Coming from the country of Italy to the capital of Russia on the occasion of the Navigation Congress, we were filled with profound joy when this superb river, which was known by the name of Rha among the Ancients and is called the Volga to-day, brought us as far as this town. Because we had the good fortune to be able to admire the beauty and the wealth of this region and to appreciate the great cordiality of its inhabitants. It is for this reason that we express thanks on behalf of a hundred towns of Italy to all those to whom we are indebted for the pleasure of this excursion and to you. Members of the River Commission, as well as to you, Members of the Chamber of Commerce. And raising our glasses, we drink your health.

Mr. SMRCEK, Professor at Brünn then delivered a speech in Russian, the translation of which is as follows : —

Ladies and Gentlemen,

Allow me to say a few words in this highly respected Assembly about the Margravate of Moravia, in Austria. We have come here to gather fresh knowledge generally and, in particular, information with respect to river and canal works.

At home in Moravia works for the regulation of the river courses have been undertaken on a large scale and a system of canals is to be constructed connecting the Danube with the Vistula, starting from Vienna and passing by Bretslaw, Prerov, Ostrov, as far as Cracow, and still farther through Galicia, across

Lvov (Lemberg) as far as your Dniester, and finally from Pre-rov, in Bohemia, as far as the town of Pardubitz on the Elbe. In this way, our country, thanks to the canals, will be in communication with the Black Sea, the Baltic and the North Sea which will provide great facilities for commercial intercourse with the Slavonic countries as well as with the German States and the East. That is an undertaking of great importance, because it will develop our commerce and our industry and generally, our whole economic life.

We have come here of our own free will, with the friendly feelings of good neighbours, who wish the Russian empire, the Russian people, her industries and her commerce, the best success and their complete development. Sister nation, the glorious Russian people, hurrah ! hurrah ! hurrah !

Other speakers followed. They were Messrs. SIROTKINE, BEKHTEREFF and CHARGUÉRAUD and Mrs. VOISIN. The speech of Mrs. VOISIN, delivered with infinite grace, was addressed to the Russian ladies to thank them for the very cordial manner in which they had welcomed the ladies come to the Congress.

At the end of the reception flowers were presented to all the ladies and handsome albums of views to all the excursionists. The company finally broke up and went back on the steamers, which conveyed the members of the Congress to the railway station side, who an hour later were on their way to Moscow.

The programmes of the sojourn at Moscow were distributed among the excursionists already at Nijni-Novgorod by special messengers sent by the Moscow Local Committee.

Although the excursionists were spread all over this immense town full of places of interest, they were nevertheless able to gather all together even on this occasion. The first occasion they had to do so was during the visit to the Kremlin palace, another at the last common breakfast in the dining saloon of the « Slaviansky Bazar » Hotel and finally in the Trétiakoff galleries.

The municipal council of Moscow had the happy idea of arranging a reception for the Congress members in the galleries of Russian national painting, in this art temple. The round tables to which the Congress members sat down after the visit

to the galleries were strewn with fresh flowers. The first speech was delivered by the mayor of Moscow, Mr. GOUCHKOFF, Mr. DE TIMONOFF, General President of the Congress replied to him on behalf of the members of the Congress to the following effect : —

Ladies and Gentlemen,

It is for the purpose of replying to the very gracious speech of the Mayor of Moscow that I rise before anybody else, in the belief that other members of our Congress will be equally unable to keep silence at a festival like the one which gathered us together to-day and which cannot but inspire us Russians with a feeling of pride, which you, our friends from abroad, will no doubt forgive us. It was in Moscow, the centre of our vast country, that the idea really originated to gather you together for the last time in these superb galleries filled with such remarkable works of art and to show you, before the final moment of separation, the grand route upon which all nations march together, and which leads towards the beautiful, towards the ideal. We are all under the charm of this welcome, full of mysterious gentleness which will leave a lasting trace in our hearts. We shall never forget either the charming grace of the ladies who have received us like good fairies, nor the profound impression of the canvasses we have admired, nor the perfume of the flowers strewn in such profusion in our way, nor the words of the mayor, so full of courtesy. Nor shall we forget that the picture gallery, where we are about to take leave from one another, is a private undertaking brought into existence by the brothers Trétiakoff and we shall preserve a souvenir of admiration for the liberal spirit, so full of loyalty and high-mindedness of these two indefatigable seekers after truth in art, who fully understood it from the very outset that when one creates a work like that upon which they were to confer their name, if it was to be made lasting and of some use, it was necessary to open the doors very wide to all talents and all energies.

But at the same time I wish we could obliterate from our memory the painful impression caused by the still visible traces of the awful floods of the River Moskva, a short time ago, the waters of which almost reached the picture gallery which hence-

forth will be so precious to us. And in the presence of this misfortune which has visited Moscow and may return at any moment, as the Navigation Congress has included in its programme the fight against floods, will it not some day embody in its studies the search for remedies which are applicable to the actual case? To this query an affirmative answer must be given. It goes without saying that in our future work we shall pay special attention to such actual and interesting problems as are presented to us by Moscow on account of its floods as well as of its inland port which has still to be created, and the organisation of an exchange of goods between her navigable ways and the railways which converge here from all parts of Russia.

It is to this very honourable sentiment, by which, I feel, my dear colleagues of the Navigation Congress are animated, to this broadness of their view that I am happy to be able to pay a respectful tribute to-day on the eve of our separation. May they ever remain faithful to this spirit and allow me in a feeling of deep and loyal confraternity to drink on their behalf to the prosperity of the town of Moscow and to the health of its very distinguished mayor, Mr. Nicolas Goutchkoff.

Other speeches followed by delegates of various countries, notably those of Messrs. RÉSAL, MÜLBERGER and MAGANZINI. The last speech, with which so to speak, the Congress closed, was made in German, amidst general applause, by Professor SMRCEK, of Brünn.

The following is a translation : —

Ladies and Gentlemen,

The unforgettable and beautiful days of the XIth. International Congress of Navigation at St. Petersburg with its programme of serious studies, its numerous brilliant and sympathetic welcomes with which in accordance with Slavonic custom we have been so cordially received, these beautiful days are past and the hour is approaching when all its numerous participants from all countries of the globe will leave the immense realm of the Emperor, the great and powerful Russian empire, to go home to give an account at home of what the Congress has given to them. I do not intend to dwell more

particularly on this portion of the work of the Congress, but nevertheless feel it my duty to state that the numerous publications presented to us, as well as the reports and discussions at St. Petersburg, represent valuable contributions to, science which is making rapid strides towards progress.

Allow me, ladies and gentlemen, to allude briefly to the carefully arranged and highly successful excursions to Kronstadt, on the Neva and to the Lake Ladoga, to Narva, Imatra, Peterhoff and more especially that on the largest river of Europe, the powerful Volga, to remind you of the cordial receptions at Rybinsk, Yaroslavl, Sormovo and Nijni-Novgorod, this famous town of Eastern Europe with its admirable situation ; allow me that here, in the *Bélaïa Matushka Moskva*, the heart of Russia, I may express the most hearty and sincere thanks on behalf of myself and all others who have taken part in them, to the gentleman, who for many months has organised and directed all the preparatory work, which was indispensable to ensure the success of this Congress ; who has done everything in his power to make the stay in Russia as agreeable as possible for the members of the Congress ; who has known how to make himself useful to everybody in an amiable, devoted and untiring manner. That, gentleman, as you all know it well, is the President of the XIth. International Congress of Navigation, the great savant, the friend of all us, His Excellency Mr. de Timonoff. I beg you to drink with me the health of His Excellency, Mr. de Timonoff ! Hurrah, hurrah, hurrah !

This speech, which was delivered in a voice full of sincerity and emotion, was received with prolonged shouts of « Hurrah ».

And now the moment of separation had arrived. Three groups of members of the Congress made further small excursions in boats and carriages in the town and environs of Moscow ; some of them continued, next day, the journey as far as the Crimea and Odessa by the Black Sea, and the evening express on that same day took others back to Petersburg.

Excursion on the Marie navigable waterway.

By the authority of H. E. the Minister of Ways of Communication, the Director of Roads and Inland Navigation has kindly offered to the members of the XIth. International Con-

gress of Navigation a trip to visit the navigable waterway joining Rybinsk on the Volga with the mouths of the Neva at St. Petersburg. The following members joined : Mr. and Mrs. Ockerson of St. Louis (U. S. A.), Professor Gerard of Brussels, Mr. Ottmann, Engineer of Duisburg and Mr. Weinberg, engineer of Cincinnati-St. Petersburg.

Two steamers belonging to the Ministry of Ways of Communication, the *Cheksna* under Capt. Mankovski and the *André Birileff*, under Capt. Alexandrine, were placed at the disposal of the members of the Congress and the trip began on the evening of May 25., the point of departure being the Liteiny Bridge at St. Petersburg. The next morning the boats entered near Schlüsselburg the canals of the Ladoga to follow one of the longest navigable routes in the whole world.

At the village of Nossok the excursionists received from Mr. Bouchmakine, Director of Ways of Communications in this district the following telegram : « Detained by urgent business, I am deprived of the pleasure and honour to greet my dear guests at the boundary of the division of Russian navigable ways confided to me. I shall meet you at the village of Vosnessenié where the artificial portion of the Marie route begins. In the meantime I welcome you and wish you a pleasant trip on behalf of all the officials of the Department. »

At the village of Vosnessenié the excursionists were received by Mr. Bouchmakine, the engineer, who kindly undertook the management of the excursion.

The members of the Congress were able to study the canals in their smallest technical and economical details and for this purpose plans and sections of everything that could interest the visitors were placed at their disposal. The impressions gathered on this interesting trip were sufficiently vivid to ensure lasting memories, but the excursionists will specially recall with a feeling of gratitude the welcome prepared for them by the Municipal Council of the town of Tshérépovetz with the mayor of the town, Mr. A. S. Volkoff at their head.

This little town made a most agreeable impression on the members of the Congress, who did not expect to find so many young scholars in a town of a few thousand inhabitants. After a reception and banquet at the townhall, the travellers visited the museum and the technical school. These two institutions owe their origin to M. Milioutine, a former mayor, whose name

is connected with everything that testifies the prosperity of the town of Tshérépovetz.

The trip took six days and on the 31. May, towards 10 o'clock in the morning, Rybinsk was reached. The port of Rybinsk produced a deep impression on the foreign members of the Congress who began to count the endless file of barges and boats all sizes and descriptions. The presence of a great number of labourers showed that a considerable portion of the work of transshipment is done by hand, which accounts for the animated and noisy bustle in the port of Rybinsk. The members of the Congress were able to observe here the different types of Russian labourers.

The steamer *Cheksna* was kindly placed at the disposal of the travellers to convey them as far as Yaroslavl where they arrived on 31. May at 8 o'clock in the evening.

APPENDIX

EXHIBITION OF THE XIth. INTERNATIONAL NAVIGATION CONGRESS

Additional List of Exhibits.

« Kavkas and Mercury » Navigation Co. : —

Models and photographs of the Company's boats.

Russian Navigation and Commercial Co. : —

Several models of boats.

N. Pouzyrevski, Engineer : —

Plans of the northern River Donetz.

Nobel Bros. Co. : —

Model of a new type of boat for carrying naphtha.

Russian Society for the Protection of Public Health : —

Various publications.

Van der Vliet Workshops : —

Motor, sailing and rowing boats.

Riazan and Uralsk Railway Co. : —

Description, designs and plans of landing stages constructed by the Company on the Volga.

Department for Pilotage and Lighthouses of Finland : —

Seven models of icebreakers and pilot boats. Twentyfive models of pilot cutters. Model of a lighthouse. Ten models of various appliances for taking soundings. Six lighthouse lanterns. A buoy. Forty plans, photographs and charts. A chart in relief.

V. Mattoussévitch, engineer : —

Album of designs in connection with regulation works of the Volga with explanatory text. Album of photographs and Report on the works for constructing a harbour at Kinechma, Province of Kostroma.

Russian Volunteer Fleet : —

Two models of boats.

L. L. Zotoff : —

Models of chains and anchors.

« Russko-Vostotshno-Asiatskoe-Parokhodstvo » Shipping Co : —

Charts, plans and high-reliefs of boats.

Ministry of Ways of Communication. -- District of St.-Petersburg :

Designs, plans and models of lighthouses.

Poutiloff works : —

Designs, photographs, plans of boats, dredgers and cranes constructed by the Poutiloff Works.

Mourman Expedition : —

Chart of the region of the work of the expedition. Charts, diagrams, pictures. Models of boats.

Society for Saving Shipwrecked Persons : --

Portrait of the august Protectress of the Society. Map of Russia showing life-boat stations. Models of boats, buoys, life-saving appliances. Maps, photographs, publications of the Society.

J. H. Köbke : —

A tent with motor boat. Petrol motor, benzine motor, boats, sails, flags, life-saving appliances.

Kolomenski Works : --

Models of boats and tugs with Diesel engines. High-reliefs of tugs and schooners, of passenger boats. Designs of boats and dredgers.

D. S. Sirotkine : —

Models of luges, photographs.

N. K. Piatnitsky, Engineer : —

Models and designs of works in concrete and reinforced concrete in the harbour of Touapsé.

Maison H. Treck : —

Apparatus for lighting lighthouses and buoys by « Acé-
tone » gas.

Lie-Estländisches Bureau für Landeskultur : —

Graphic representation of irrigation and drainage works.

Central Asiatic Railway : —

Plans, designs and pictures of irrigation and drainage works in Central Asia and of the regulation works of the River Amu-Daria.

Hotarski, engineer.

Institute of Ways of Communication.

Franco-Russian Works.

